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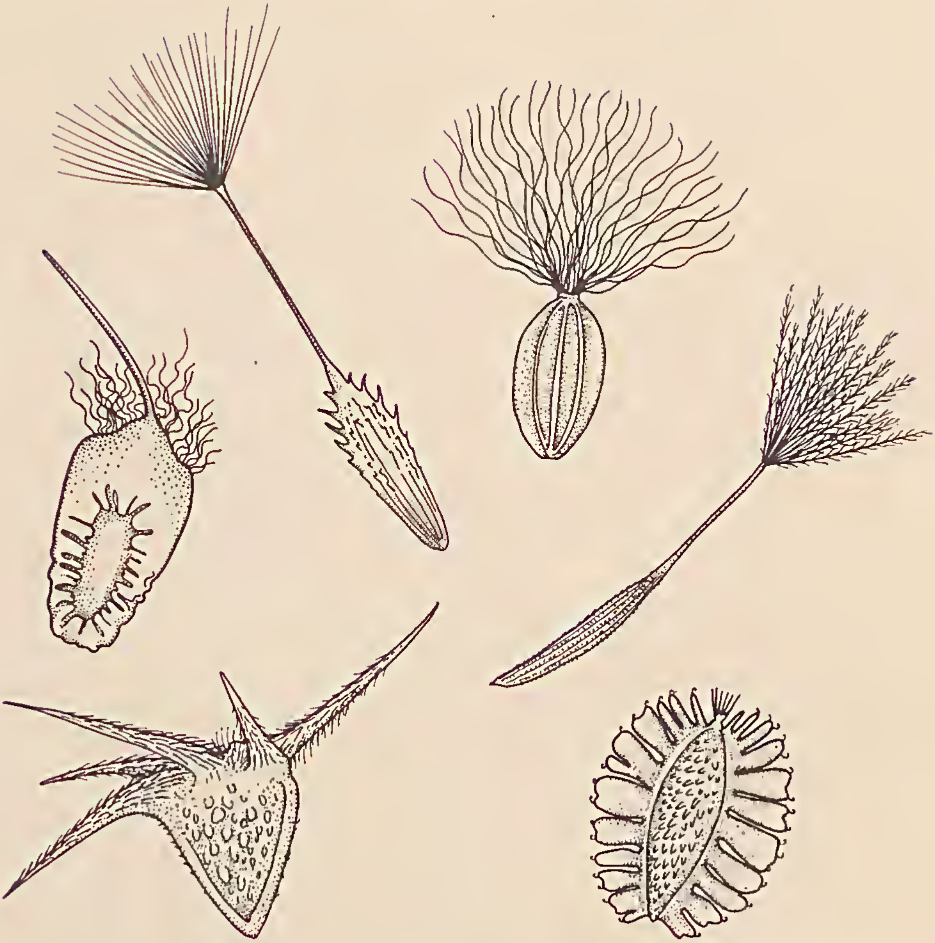
Sydney 1: 100 000 and Ku-ring-gai Chase National Park vegetation maps

Ecology of Sydney plant species
Part 2: Dicotyledon families Asteraceae to Buddlejaceae



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Ecology of Sydney plant species
Part 2: Dicotyledon families Asteraceae to Buddlejaceae

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The natural vegetation of the Sydney 1:100 000 map sheet

Doug Benson and Jocelyn Howell

Benson, Doug & Howell, Jocelyn (National Herbarium of New South Wales, Royal Botanic Gardens Sydney, New South Wales, Australia 2000) 1994. The natural vegetation of the Sydney 1:100 000 map sheet. Cunninghamia *3(4): 677–787.* The composition and extent of the present natural vegetation on the Sydney 1:100 000 map sheet 9130 (bounded by latitudes 33° 30' and 34° 00' S and longitudes 151° 00' and 151° 30' E) are mapped and described in terms of structure and characteristic species. Sixteen map units covering 42 plant communities are recognised and related to geology and physiography. The most extensive unit is the well-known Hawkesbury Sandstone vegetation, which has been broadly subdivided into Sydney Sandstone Gully Forest (Map unit 10ag), Sydney Sandstone Ridgetop Woodland (Map unit 10ar) and Coastal Sandstone Heath (Map unit 21g). Along the coast north of Long Reef more clayey soils, developed on the Narrabeen Formation, carry tall open-forest, open-forest and coastal heath vegetation. There are patches of scrub on Pleistocene sand deposits at Bouddi and La Perouse, and remnants of open-forest on Wianamatta Shale further west. A map of the vegetation of Ku-ring-gai Chase National Park and Muogamarra Nature Reserve (1:40 000 scale) showing 21 plant communities is provided on the back of the Sydney map.

Twenty-three major conservation reserves for the Sydney map area are briefly described, with species lists for most. Seventy-eight significant plant species are listed for the area, 41 of which are listed as nationally rare or endangered species (Briggs & Leigh 1988 with current ROTAP updatings); others are of regional significance. Species listed are either rare, threatened or of botanical significance in terms of geographic distribution. Regional affinities, historical changes, Aboriginal and European impacts, and conservation of vegetation are discussed.

Introduction

In January 1788 the ships of the First Fleet, sent from England with convicts to found a penal colony in New South Wales, entered Birra Birra, the land of the Aboriginal people. They had sailed into the lower reaches of what we now know as Sydney Harbour. As the colonists proceeded westwards towards Sydney Cove, Captain Watkin Tench of the Marines was amongst those 'enjoying the luxuriant prospect of its shores, covered with trees to the water's edge, among which many of the Indians were frequently seen'. George Worgan, surgeon of the *Sirius*, observed 'Here, a romantic rocky, craggy Precipice over which, a little purling stream makes a Cascade There a soft vivid-green, shady Lawn attracts your Eye.' Having found Botany Bay unsuitable for settlement, the fleet's captain, Captain Arthur Phillip, was now searching for a better site further north, at the inlet named Port Jackson by

Captain Cook in 1770. He found this an ideal harbour for the ships, and noted glowingly that: 'The necks of land that form the different coves, and near the water for some distance, are in general so rocky that it is surprizing such large trees should find sufficient nourishment, but the soil between the rocks is good, and the summits of the rocks, as well as the whole country round us, with few exceptions, are covered with trees' (Tench 1979, Worgan 1978, Phillip 1789).

In no time, trees were cut down, the ground cleared, and huts constructed. 'The abode of silence and tranquillity was now changed to that of noise, clamour, and confusion', observed David Collins, legal officer of the new settlement (Collins 1798).

Using historical and contemporary sources, Benson and Howell (1990a), in *Taken for granted: the bushland of Sydney and its suburbs*, described the original vegetation patterns in the County of Cumberland in terms of eight major vegetation types, and discussed the changes that followed the European-style agricultural and urban development of the area over the next two centuries. Particular emphasis was given to each of the 40 local government areas. The present paper, part of the Sydney Region Vegetation Map Series, describes the current condition and extent of the natural vegetation of the north-eastern half of the County of Cumberland, on the Sydney 1:100 000 map sheet, just over 200 years after the beginning of European settlement. As far as practicable, this work does not repeat *Taken for granted*, and only a small amount of historical material is included. Instead, the emphasis is on describing the present-day vegetation in terms of 16 map units, identifying significant areas and species, and includes floristic lists, brief descriptions and references to the major National Parks.

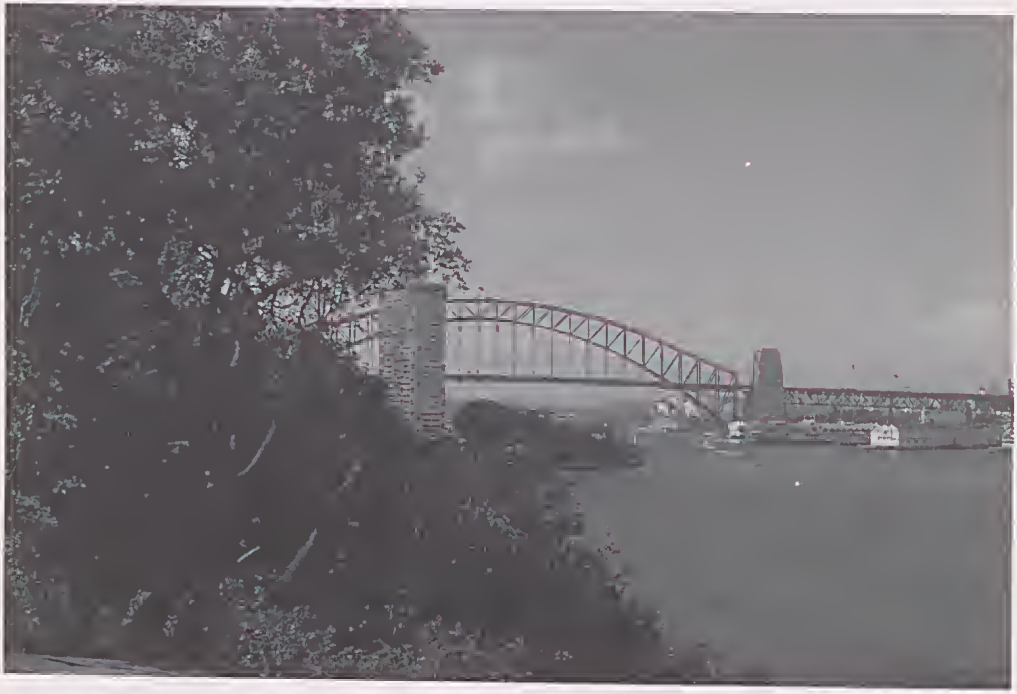


Figure 1. Sydney is probably one of the few great cities of the world where natural vegetation still survives so close to the heart of the city. Here *Banksia integrifolia* grows on the rocky Harbour foreshore at Balls Head.

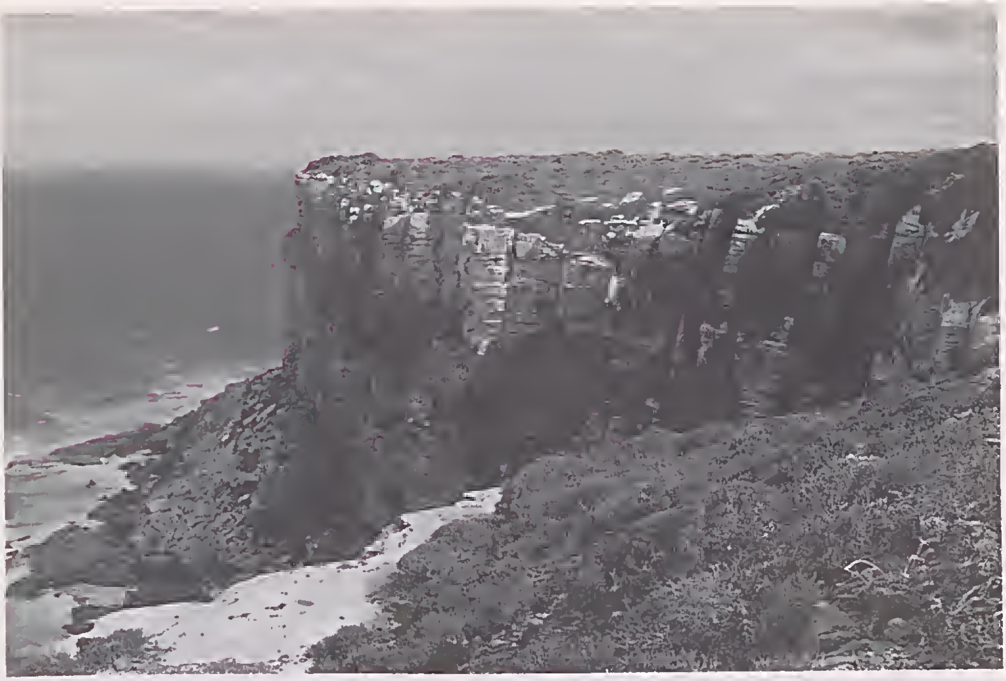


Figure 2. Exposures of Hawkesbury Sandstone such as this at North Head form the prominent headlands around Sydney Harbour. These 'craggy precipices' delighted the first settlers until they found that this country was so difficult to farm.

The current work updates and enlarges a previous draft report (Benson 1980a) and provisional map (1980). The Sydney 1:100 000 vegetation map sheet is located inside the back cover. A vegetation map of Ku-ring-gai Chase National Park and Muogamarra Nature Reserve at 1:40 000 scale (originally prepared at 1:25 000 scale) is also provided. This map, taken from the vegetation surveys of Thomas and Benson (1985a,b), has not been readily available before, and provides a detailed picture of an important conservation and recreation area.

Location, physiography and climate

The Sydney 1:100 000 Vegetation Map Sheet (based on the Sydney 1:100 000 Topographic Sheet 9130, AUSLIG, Canberra) is bounded by latitudes, 33° 30' and 34° 00' S, and longitudes, 151° 00' and 151° 30' E. It includes the city of Sydney and suburban areas as far west as Parramatta, and the coastline from the Bouddi Peninsula and Broken Bay in the north to Botany Bay and the Georges River in the south. Natural vegetation is almost all confined to the northern half of the sheet, which includes Ku-ring-gai Chase National Park, Marramarra National Park, Muogamarra Nature Reserve, and parts of Brisbane Water and Bouddi National Parks.

Topographically, the northern half of the Sydney map sheet area is a dissected plateau of Hawkesbury Sandstone, the south-eastern corner of the Hornsby Plateau (Herbert 1983), generally 20–50 m elevation near Sydney and rising to 200 m high around

Glenorie in the north-west corner of the map. The major inlets, Broken Bay, Port Jackson and Georges River/Botany Bay are drowned river valleys. Most of the National Parks and remaining natural vegetation are on this Hawkesbury Sandstone landscape, as its thin sandy soils have made it useless for agriculture in comparison with the more fertile Wianamatta Shale soils of the southern half of the map sheet (Chapman & Murphy 1989). The Wianamatta Shale landscapes are gently undulating, covering the higher ridgelines of the Hornsby Plateau in the settled areas of northern Sydney. South of the harbour they are low-lying and extend from the city of Sydney westward to Parramatta, and from there across the Cumberland Plain to the Hawkesbuy River and the foot of the Blue Mountains. Being topographically less rugged and having more fertile soils than those on the Hawkesbury Sandstone, these areas were settled and cultivated early in the nineteenth century. In the twentieth century extensive suburban development has followed.

The Narrabeen Group (Newport and Garie Formation, and Terrigal Formation) underlies the Hawkesbury Sandstone and outcrops north of Sydney along the Warringah Peninsula (now part of Pittwater Council area) and north of Broken Bay (Herbert 1983). This has interbedded laminites, shales and sandstones, and forms higher-nutrient soils than the adjacent Hawkesbury Sandstone landscapes. In contrast, in the Eastern Suburbs between Botany Bay and Bondi, the extensive sand deposits of Holocene and Pleistocene age overlying the Hawkesbury Sandstone have extremely low nutrient status, but the original vegetation here has been almost completely destroyed by suburban development.

A few volcanic outcrops occur in the area as diatremes or dykes. Soils have been mapped and discussed by Walker (1960) and Corbett (1972), and most recently a Soil Landscapes Map at 1:100 000 scale has been produced (Chapman & Murphy 1989). This describes 25 soil landscapes and relates closely to the vegetation map units.

Rainfall is related to elevation and coastal influence and occurs throughout the year, but is heaviest in June. It is highest (above 1400 mm p.a.) along the crest of the upper North Shore (e.g. Pymble 1444 mm p.a.) and on the coast (generally 1200–1400 mm p.a.) (e.g. Sydney — Observatory Hill 1209 mm p.a., Narrabeen 1278 mm p.a.). On the lower-lying country around Botany Bay it is about 1100 mm and decreases westward with increasing distance from the coast (Ashfield–Burwood about 1000 mm, Parramatta about 900 mm p.a.). Similar decreases in rainfall occur on the higher sandstone country further north (e.g. Hornsby about 1200 mm, Glenorie 900 mm p.a.) (Bureau of Meteorology 1979).

Mean monthly maximum temperatures for January are 25.9° C at Sydney and 28.1° C at Parramatta, while mean monthly minimum temperatures for July are 7.8° at Sydney and 4.6° C at Parramatta. The lowest (screen) minimum temperatures recorded are 2.1° C for Sydney, -2.9° C for Parramatta, and -4.6° C for Pennant Hills. The lowest terrestrial (i.e. ground level) minimum temperature recorded is -4.4° C for Sydney (the screen minimum was 3.7° C at this time). Frosts very rarely occur near the coast, the frost period increasing with distance from the coast and with elevation. The average severe frost period (i.e. screen minimum temperature less than 0° C), for example, is 85 days at Pennant Hills, 38 days at Parramatta and 46 days at Bankstown.

Average soil temperatures at Sydney, at 25 mm depth, range from 11.3° C in July to 21.4° C in February (data from Bureau of Meteorology 1979).

Methods

Areas of vegetation with similar structure (Specht 1970) and floristics (dominant species) were grouped to form the map units on the basis of aerial photopatterns and recognisable geological and landscape characteristics. Aerial photography from the New South Wales Department of Lands (Sydney 1982 1:16 000 colour) was used. Geology was based on geological maps (NSW Dept of Mines 1966, NSW Dept of Mineral Resources 1983). Compilation maps were prepared at 1:25 000 scale and subsequently reduced to 1:100 000 scale with little loss of detail.

Present-day (i.e. 1982) naturally-occurring vegetation is mapped; presumed vegetation formerly covering cleared agricultural and suburban areas is shown in Figure 1 and as an inset on the map sheet. An alphanumeric code is used to distinguish individual plant communities. The numeric code represents the structural form of the plant community and the alphabetic code represents the characteristic species. The codes used are consistent throughout the Sydney Region 1:100 000 Vegetation Map Series, allowing map units to be cross-referenced (Benson 1986a, Keith & Benson 1988, Benson & Keith 1990, Benson 1992a).

There are a number of constraints in reducing the complex pattern of natural vegetation to a map format. The map units recognised are not all of equivalent rank. Some are essentially land-units made up of several groupings of plant species, termed plant communities associated with a particular geological or physiographic type (e.g. map units 4a, 10ag, 10ar), whereas others are more early plant associations (*sensu* Beadle & Costin 1952) (map units 6b, 9o). Generally the term 'plant community' is used for the basic vegetation unit. For ease of reference, map units have also been provided with common names based loosely on habitat and composition.

The vegetation map is a diagrammatic attempt to simplify, over an extensive region, the distributional patterns of an often rich and varied flora. It is scale-dependent and map units will almost invariably include unmapped areas of other map units too small to be shown separately. Similarly, most plant communities do not have clear-cut boundaries, but grade into each other, often over a broad ecotone. For mapping purposes such boundaries have to be approximated to a line.

Field checking has been carried out intermittently between 1975 and 1990 and has included recording notes on structure, characteristic species of major strata and associated environmental factors. As major patterns necessary for mapping purposes are generally well known, broadscale computer analyses of floristic data have not been necessary. Floristic analyses of a number of local areas have been carried out and are referred to in the descriptions e.g. coastal vegetation (Adam, Stricker et al. 1989), Ku-ring-gai Chase National Park (Outhred et al. 1985), Lane Cove River National Park (Clarke & Benson 1987), and Garigal National Park (Sheringham & Sanders 1993). Extensive species lists have been compiled for some areas, generally during the course of specific local vegetation studies.

Species recorded for major conservation areas are provided (see Table 3). Species lists for other sites have not been presented, though some may be listed in the bibliographies of floristic lists (Pickard 1972; Bryant & Benson 1981; Keith 1988; Benson & Melrose 1993). Botanical names used are those currently recognised at the National Herbarium of New South Wales. For authorities see Harden (1990–93).

Review of vegetation studies

Aboriginal people left no written records of the vegetation that supported them for thousands of years, though some of their names for plants and their uses were recorded by nineteenth century botanists such as Joseph Maiden (1889). Surprisingly, only a handful of Aboriginal names for Sydney plants have survived in current usage. Examples include Waratah, Geebung, Gymea, Mugga, Burrawang and Bangalay.

The scientific study of plants in the Sydney region began at Botany Bay in April 1770 when Joseph Banks and Daniel Solander landed from Captain Cook's *Endeavour* and described the 'rich and diverse flora'. The influence of the botanist Joseph Banks was crucial in the selection of Sydney as the site for a settlement. His ongoing interest ensured continuing concern for accurate botanical study and plant collection in the colony. Other professional botanists and botanical collectors were often based with colonial governors and included in exploring parties. Among these were George Caley, who was employed in the colony from 1800–1810 by Joseph Banks, and Allan Cunningham, collector for the Royal Botanic Gardens at Kew from 1817 and Colonial Botanist and Superintendent of the Sydney Botanic Gardens in 1837. As botanical collector Cunningham accompanied John Oxley and Philip King on early expeditions (1817–1822), and later himself explored parts of northern New South Wales and the Darling Downs of Queensland. Being primarily botanical collectors for overseas herbaria, such workers published very little themselves, but some of the diaries they kept have been subsequently published e.g. see Lee (1925) for Cunningham, and Andrews (1984) and Currey (1966) for Caley.

The European explorers and settlers were concerned with the agricultural value of the new country and used the vegetation as an indicator of its potential. They were also concerned with any likely vegetable products such as timber or food plants that could be of use to them. Most of the published accounts of explorers and visitors to the colony contain some references to the vegetation, though these accounts are of variable quality. Botanical names are used infrequently and identification of plant species is often difficult or impossible.

Baron Ferdinand von Mueller was the outstanding colonial botanist of the second half of the nineteenth century, and collectors sent many specimens to him in Melbourne. Among local Sydney collectors were the Reverend William Woolls, who published a number of lists of local Parramatta species, and Louisa Atkinson, who made collections at Berrima and Kurrajong, though most of their collections went either to Europe or Melbourne. Most of the collections now readily available to researchers in New South Wales date from the establishment of the National Herbarium of New South Wales in the 1880s by the Director of the Sydney Botanic Gardens, Charles

Moore. Moore's successor, Joseph Henry Maiden, was a very active botanist and enthusiastically developed the National Herbarium of New South Wales as a national collection. He concentrated on taxonomic work, and in particular the eucalypts, but also published papers on aspects of ecology. Sydney botanists published mainly through the journals of the Linnean Society of New South Wales and the Royal Society of New South Wales.

A.A. Hamilton's *Topographical, ecological and taxonomic notes of the ocean shoreline vegetation of Port Jackson* (1918) and *Ecological study of the saltmarsh vegetation in the Port Jackson district* (1919) are probably the first major descriptive ecological papers for the Sydney area. These were followed by papers on the ecology of the vegetation at Mount Wilson (Brough, McLuckie & Petrie 1924; Petrie 1925; McLuckie & Petrie 1926), Bulli (Davis 1936, 1941a, 1941b) and on the New South Wales Central Coast (Pidgeon 1937, 1938, 1940, 1941). In a series of major papers, Ilma Pidgeon described the general differences in vegetation on Wianamatta Shale and Hawkesbury Sandstone in terms of a series of plant communities in various stages of succession, the

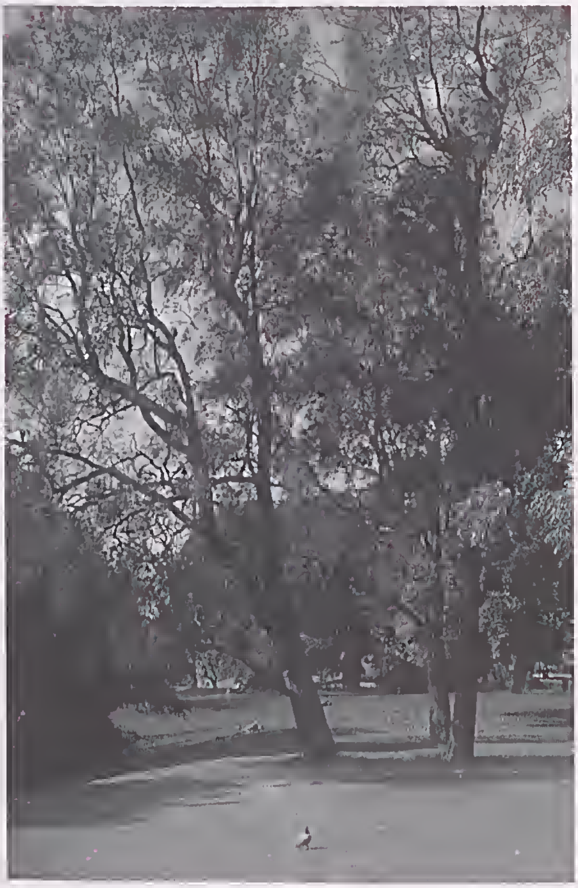


Figure 3. J. H. Maiden, an early Director of the Royal Botanic Gardens Sydney, saw the value of conserving native vegetation, and it is largely due to his foresight that these remnant *Casuarina glauca* trees still survive in the Sydney Gardens today. This species rootsuckers vigorously, and these trees are probably genetically identical with the pre-1788 trees here.

stages being related to physiographic and moisture conditions. She did not include maps, but provided detailed descriptions of the plant communities, in particular of the Hawkesbury Sandstone of the Hornsby Plateau. Phillips (1947) complemented this work with descriptions of the main plant communities of the Wianamatta Shale.

Interest then turned towards the role of soil nutrients. Nola Hannon (1956, 1958) examined the role of soil nitrogen. N.C.W. Beadle (1953, 1962, 1966) demonstrated that the distribution of major vegetation types around Sydney relates largely to the differing levels of soil nutrients, particularly phosphorus, essentially derived from the parent material. Smaller-scale variation was related to physiographic factors. Rainforest vegetation is generally confined to soils with higher phosphorus levels while the sclerophyll vegetation occurs on soils with very low phosphorus levels. Increased soil nutrients in run-off from disturbed areas may promote exotic weed invasion in naturally low-nutrient sites (Clements 1983).

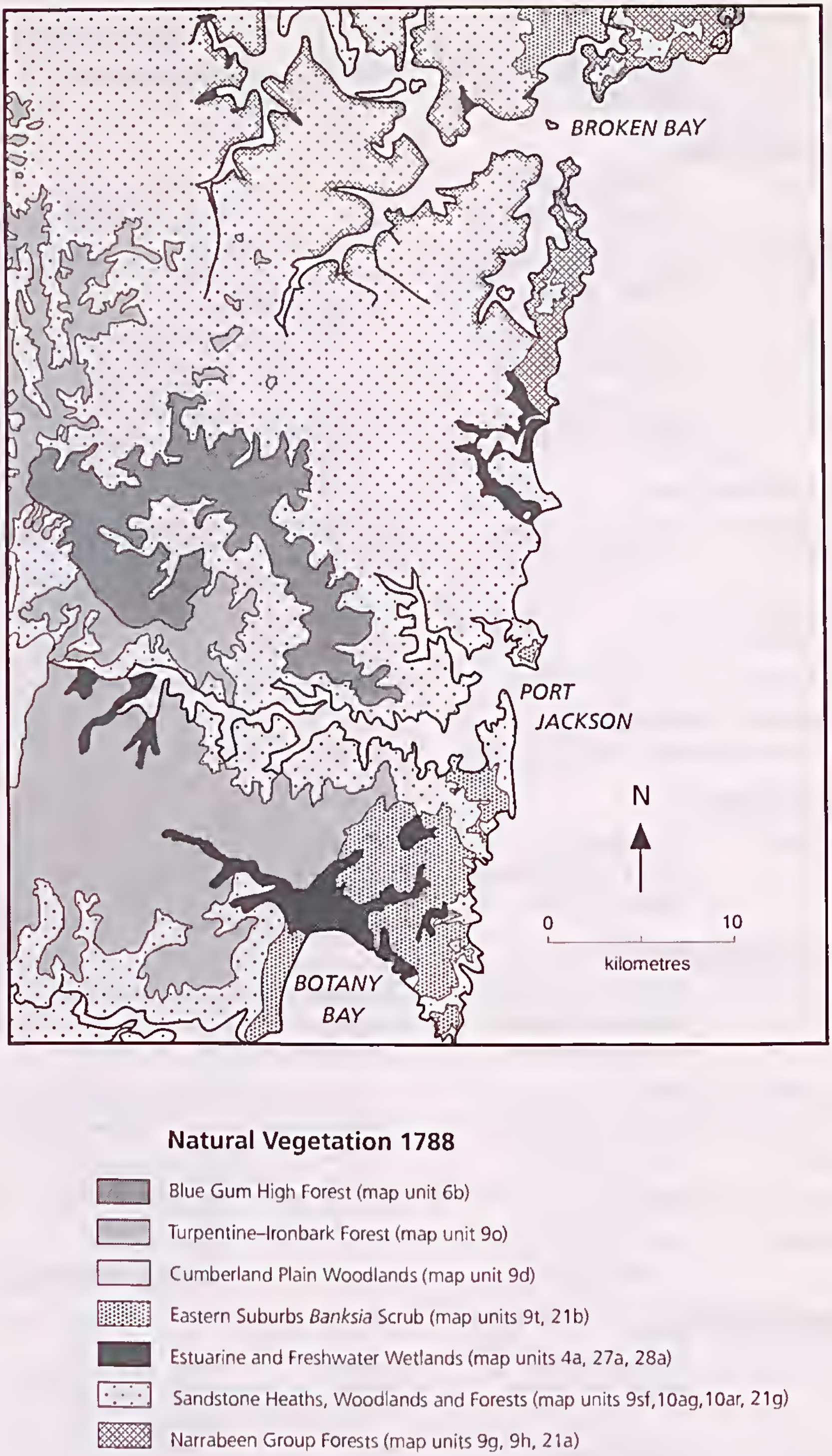
Recent interest in Sydney vegetation, as a result of the general awareness of conservation issues, has led to many local vegetation surveys and inventories (see Pickard 1972, Bryant & Benson 1981, Keith 1988, National Trust 1991, Benson & Melrose 1993), and to the vegetation surveys in the Sydney Region Vegetation Map Series. Accounts of the vegetation with particular reference to changes over the past 200 years include Benson and Howell (1990b) and in particular *Taken for granted* (Benson & Howell 1990a). As the present map sheet deals with about half of the area covered by Benson and Howell (1990a), the relationship between the eight general vegetation types described there and the map units described here is given in Table 1. A modified section of their map showing the extent of natural vegetation in 1788 for the Sydney map area is given in Figure 1.

As well as survey and descriptive studies, there has also been increasing and much-needed work on problems associated with conservation biology and natural area management. In particular, aspects such as fire (e.g. Bradstock & Myerscough 1981), soil nutrients and the spread of exotic weeds, and studies on the ecology of individual species (e.g. Auld & Myerscough 1986, Auld 1986) are now receiving due attention. We also hope to make ecological data on individual plant species more accessible through the Ecology of Sydney Plant Species project (Benson & McDougall 1993).

Table 1. Vegetation types in *Taken for granted*, Benson and Howell (1990a) (in bold type) with corresponding Sydney map sheet map units and codes.

Blue Gum High Forest	Blue Gum High Forest 6b
Turpentine–Ironbark Forest	Turpentine–Ironbark Forest 9o
Cumberland Plain Woodlands	Transition Forest 9d
Sandstone heaths, woodlands and forests	Sydney Sandstone Gully Forest 10ag Sydney Sandstone Ridgetop Woodland 10ar Duffys Forest 9sf Coastal Clay Heath 21a Coastal Sandstone Heath 21g
Eastern Suburbs Banksia Scrub	Coastal Dune Forest 9t Coastal Dune Heath 21b
Freshwater and Estuarine wetlands	Estuarine Complex 4a Coastal Swamp Forest Complex 27a Freshwater Reed Swamps 28a

Glen Forest 6c, Spotted Gum–Blackbutt Forest 9g and Narrabeen Slopes Forest 9h were not treated separately in *Taken For Granted.*


BROKEN BAY
PORT JACKSON
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kilometres
BOTANY BAY
Natural Vegetation 1788
Blue Gum High Forest (map unit 6b)
Turpentine–Ironbark Forest (map unit 9o)
Cumberland Plain Woodlands (map unit 9d)
Eastern Suburbs *Banksia* Scrub (map units 9t, 21b)
Estuarine and Freshwater Wetlands (map units 4a, 27a, 28a)
Sandstone Heaths, Woodlands and Forests (map units 9sf,10ag,10ar, 21g)
Narrabeen Group Forests (map units 9g, 9h, 21a)

Figure 4. Presumed 1788 or pre-European pattern of natural vegetation of the Sydney map sheet area.

Table 2. Map unit, common name, structure, main canopy species, geology and occurrence for plant communities in the area covered by the Sydney 1:100 000 map sheet

Map unit description

Map unit	Structure	Main canopy species	Geology	Occurrence
4a	**Estuarine Complex**			
	Open-scrub	*Avicennia marina* *Aegiceras corniculatum*	Holocene alluvium	Estuarine mudflats, regular tidal inundation
	Herbland	*Sarcocornia quinqueflora* *Suaeda australis*	"	Occasional tidal inundation
	Rushland	*Juncus kraussii* *Phragmites australis*	"	Infrequent tidal inundation; brackish water
	Low open-forest	*Casuarina glauca* *Baumea juncea*	"	Poorly-drained, some saline influence
6b	**Blue Gum High Forest**			
	Tall open-forest/ Open-forest	*Eucalyptus pilularis* *Eucalyptus saligna*	Wianamatta Shale	Broad ridges with residual shale soils North Shore to Hornsby
6c	**Glen Forest**			
	Tall open-forest	*Eucalyptus saligna*	Diatremes	Isolated valleys
	Tall open-forest	*Eucalyptus agglomerata* *Angophora floribunda*	"	"
9d	**Transition Forest**			
	Open-forest	*Eucalyptus fibrosa* *Eucalyptus moluccana* *Melaleuca decora*	Wianamatta Shale	Auburn
9g	**Spotted Gum–Blackbutt Forest**			
	Open-forest	*Eucalyptus gummifera* *Eucalyptus maculata* *Eucalyptus pilularis*	Narrabeen Group	Bouddi Peninsula
	Open-forest	*Eucalyptus maculata* *Eucalyptus paniculata*	"	Lower hillslopes, Warringah Peninsula
	Woodland	*Eucalyptus umbra* *Eucalyptus paniculata*	"	Exposed slopes, Bouddi Peninsula
	Open-forest	*Archontophoenix cunninghamiana*	"	Deep gullies, Bouddi Peninsula
9h	**Narrabeen Slopes Forest**			
	Open-forest	*Eucalyptus deanei* *Angophora floribunda*	Narrabeen Group	Lower hillslopes, Broken Bay–Hawkesbury River
	Open-forest	*Angophora floribunda* *Allocasuarina torulosa*	"	"

Map unit	Structure	Main canopy species	Geology	Occurrence
9o	**Turpentine–Ironbark Forest**			
	Open-forest	*Syncarpia glomulifera* *Eucalyptus paniculata*	Wianamatta Shale soils	Inner western Sydney, lower rainfall between Glenorie and Ryde; often near junction with sandstone
9sf	**Duffys Forest**			
	Open-forest	*Eucalyptus sieberi* *Eucalyptus capitellata* *Eucalyptus gummifera* *Angophora costata*	Wianamatta Shale–Hawkesbury Sandstone	Residual plateau remnants with ironstone gravels
9t	**Coastal Dune Forest**			
	Open-forest	*Eucalyptus botryoides* *Eucalyptus pilularis* *Angophora costata*	Holocene Sand	Ramsgate La Perouse
Sydney Sandstone Complex				
10ag	**Sydney Sandstone Gully Forest**			
	Open-forest/ woodland	*Eucalyptus piperita* *Angophora costata* *Eucalyptus gummifera*	Hawkesbury Sandstone	Sheltered hillsides, gullies
	Tall open-forest	*Eucalyptus pilularis* *Syncarpia glomulifera*	"	Gullies sheltered aspects
	Closed-forest	*Ceratopetalum apetalum* *Tristaniopsis laurina*	"	Sheltered gullies
Sydney Sandstone Complex				
10ar	**Sydney Sandstone Ridgetop Woodland**			
	Woodland/ Low woodland	*Eucalyptus gummifera* *Eucalyptus haemastoma* *Eucalyptus sparsifolia* *Eucalyptus racemosa*	Hawkesbury Sandstone	Ridges, plateaus and dry, exposed hillsides
	Woodland/ Low woodland	*Eucalyptus eximia* *Eucalyptus gummifera* *Angophora bakeri*	"	Ridges, plateaus, northwest of area
	Open-scrub	*Banksia ericifolia* *Hakea teretifolia*	"	Poorly-drained sites
21a	**Coastal Clay Heath**			
	Open-heath	*Allocasuarina distyla*	Narrabeen Group	Long Reef to Bouddi
	Grassland	*Themeda australis*	"	"
21b	**Coastal Dune Heath**			
	Open-heath	*Banksia aemula*	Pleistocene Sand	Coastal dunes, Bouddi, North Head, La Perouse
	Open-scrub	*Monotoca elliptica*	"	"

Map unit	Structure	Main canopy species	Geology	Occurrence
	Open-scrub	*Banksia integrifolia* *Leptospermum laevigatum*		
21g	**Coastal Sandstone Heath**			
	Shrubland	*Baeckea imbricata*	Hawkesbury Sandstone	Shoreline heath
	Open-heath/ Closed-scrub	*Banksia ericifolia* *Darwinia fascicularis*	"	Coastal heath, sandy shallow, soils
	Open-heath/ closed-scrub	*Allocasuarina distyla* *Banksia ericifolia*	"	Widespread, shallow sandy, often poorly-drained soils
	Open-heath	*Baeckea diosmifolia* *Baeckea brevifolia*	"	Rocky outcrop heath
	Open-heath	*Hakea teretifolia* *Banksia oblongifolia*	"	Wet heath, poorly-drained
	Sedgeland/ shrubland	*Banksia robur* *Viminaria juncea* *Gymnoschoenus sphaerocephalus*	"	Swamps, impeded drainage
	Open-scrub	*Angophora hispida*	"	Drier areas
	Shrubland (mallee)	*Eucalyptus luehmanniana*	"	Shallow soils, permanent seepage
27a	**Coastal Swamp Forest Complex**			
	Open-forest	*Eucalyptus botryoides* *Eucalyptus robusta*	Holocene stream alluvium & estuarine sediment	Creekflats or impeded drainage, Warringah Peninsula
	Open-forest	*Livistona australis*	"	"
	Scrub	*Melaleuca linariifolia* *Melaleuca styphelioides*	"	"
	Reedland	*Phragmites australis* *Typha orientalis*	"	"
	Herbland	*Persicaria strigosa* *Blechnum camfieldii* *Triglochin procera* *Baumea juncea*	"	Impeded drainage
28c	**Coastal Freshwater Swamp**			
	Open-sedgeland	*Eleocharis sphacelata* *Baumea juncea* *Persicaria decipiens*	Holocene marine sand & sandy peat	Botany Swamps, Centennial Park
	Low open-forest	*Melaleuca quinquenervia*	"	"

C Cleared

These areas are mostly suburban development. Small remnants of vegetation too small to map may occur here.

Description of map units

A summary of the plant communities recognised in the Sydney 1:100 000 sheet area, their structural formation, main canopy species and geological substrate and occurrence is given in Table 2. The map unit numbering system applies to all maps in the Sydney Region Vegetation Map Series, missing numbers being communities which do not occur in the Sydney map area.

Map unit 4a

Estuarine Complex

Small patches of estuarine vegetation are found on alluvial mudflats (Holocene sand, silt and clay deposits) subject to varying degrees of tidal inundation. 'For it is strikingly singular that three such noble harbours as Botany Bay, Port Jackson, and Broken Bay, alike end in shallows and swamps, filled with mangroves' wrote Watkin Tench in 1788 (Tench 1979). Today such vegetation still occurs in Broken Bay and the lower Hawkesbury River, Port Jackson and the Parramatta and Lane Cove Rivers and Botany Bay and the Georges River. It generally consists of a sequence of zones of different structure and floristics related to duration of tidal inundation and salinity. The following zones may be recognised, though not all will necessarily occur at any one site.

i) Open-scrub of *Avicennia marina–Aegiceras corniculatum*, confined to the seaward edge of the mudflat and made up of mangroves (1–5 m high) of the Grey Mangrove, *Avicennia marina* and the smaller, River Mangrove, *Aegiceras corniculatum*. Mangroves generally receive daily tidal inundation.

ii) Herbland of *Sarcocornia quinqueflora–Suaeda australis*, a zone of saltmarsh, a herbland dominated by the succulent stemmed members of the Chenopodiaceae, *Sarcocornia quinqueflora* and *Suaeda australis*.

iii) Rushland of *Juncus kraussii* and *Phragmites australis*. These areas have brackish water and receive infrequent tidal inundation.

iv) Low open-forest of *Casuarina glauca* and *Baumea juncea*. Areas with saline soils and periodic flooding. Swamp forest with *Eucalyptus robusta* may occur on alluvium at the landward end of the zonation (see Map Unit 27a Coastal Swamp Forest Complex).

The nature of the surrounding country may influence the floristic composition. Estuarine areas on the southern side of the Parramatta River drain from low-relief country with clay soils from Wianamatta Shale. The clayey alluvium originally supported saltmarsh interspersed with broad bare mudflat areas, only infrequently flooded and described at Homebush Bay as the dry salt plain by Hamilton (1919). The senior author remembers these sites from his schoolday explorations in the early 1960s. These clay rich mudflats, remnants of which still survive at Homebush Bay, included species such as *Lampranthus tegens*, *Wilsonia backhousei* and *Halosarcia pergranulata* subsp. *pergranulata*, not generally found in other saltmarsh areas (Clarke & Benson 1988). For example the major saltmarsh reserves at Towra point are on more sandy alluvium and do not include these dry salt-plain species. Extensive areas of these estuarine mudflats in the upper Parramatta River in Concord and Auburn municipalities and along the Cooks River in Marrickville, were destroyed by landfill between 1920 and 1970. A potential longterm threat to saltmarsh vegetation comes from the spread of the weed *Juncus acutus*, now established at Homebush Bay and Saltpan Creek.

Along the Lane Cove River and the northern side of the Parramatta River, as well as Broken Bay and the Hawkesbury River, including the lower reaches of its tributary creeks downstream from Wisemans Ferry, much of the alluvial material is sandy, being derived from the nearby Hawkesbury Sandstone. The adjacent hillslopes are generally much steeper, and estuarine areas are much more limited; mangroves predominate, saltmarsh areas are of only limited extent. Where sandstone hillsides drop sharply into the water with no build-up of alluvium, the zonation may be truncated to a line of mangroves and a few trees of *Casuarina glauca*. In the Lane Cove River agricultural and particularly urban development in the catchment has increased sedimentation and allowed mangroves, particularly *Avicennia marina* populations to expand seawards (McLoughlin 1985, Thorogood 1985), though similar expansion of saltmarsh has not been recorded. Saltmarsh and landward vegetation such as *Juncus kraussii* and *Casuarina glauca* has generally declined as a result of landfilling.

Coastal lagoons at Narrabeen and Dee Why (Coveny g), have some small remaining areas, principally of rushland, while limited stands of estuarine low open-forest persist at Warriewood.

Within the Sydney map area, descriptions of estuarine vegetation have been compiled for Brisbane Water National Park (Benson & Fallding 1981); Muogamarra Nature Reserve (Thomas & Benson 1985b); Ku-ring-gai Chase National Park (Thomas & Benson 1985a) Calna and Berowra Creeks (Pickard 1974), Smiths Creek, Terrey Hills (Kratochvil et al. 1973), Port Jackson and the Cooks River (Hamilton 1919), Bantry Bay (Upper Middle Harbour Conservation Committee 1974), Homebush Bay (Centre for Environmental Studies, 1978; Clarke & Benson 1988, Adam 1991, Kachka 1993), the Lane Cove River (McLoughlin 1985), Wolli Creek (Allaway & Clarke 1987, Brown et al. 1988).

A wealth of observations on the behaviour of saltmarsh species, together with descriptions of vegetation in areas where it has long since been removed, such as Cooks River, are given in Hamilton (1919). Detailed studies of mangrove and saltmarsh communities and individual species at Towra Point, an important estuarine area on the southern shore of Botany Bay but outside the Sydney map area, have been carried out by Clarke and Hannon (1967, 1969, 1970, 1971).

Map Unit 6b

Blue Gum High Forest

Tall open-forest–open-forest: *Eucalyptus pilularis–Eucalyptus saligna*

This was the original vegetation of the higher rainfall (above 1100 mm p.a.) Wianamatta Shale soils of Sydney's north shore suburbs (Benson & Howell 1990a). The original forest was composed of big trees, probably over 40 m in height, and it was obviously a valuable source of timber last century. For example Raymond (1832) describes land near Pennant Hills let on lease for the purpose of cutting timber: 'Their leases are nearly expired. Much fine timber still remains, the trees along this range being in general of an uncommonly large size, perhaps more so than in any other part of Cumberland, and therefore very advantageously situated so near a rapidly increasing town.'

Eucalyptus pilularis and *Eucalyptus saligna* are the main trees, originally probably in excess of 30 m tall. Other tree species include *Angophora costata*, *Eucalyptus paniculata*, *Eucalyptus globoidea* and *Syncarpia glomulifera*. An open, small-tree layer of saplings of canopy tree species and mature individuals of *Allocasuarina torulosa* is often present on drier sites, or *Pittosporum undulatum* on moister ones.

Shrubs are common, and often form a dense cover. Common species on drier sites are *Platylobium formosum*, *Leucopogon juniperinus*, *Dodonaea triquetra* and *Hibbertia aspera*. On moister sites and in depressions these shrubs are replaced by ferns, particularly *Calochlaena* (*Culcita*) *dubia*, *Adiantum aethiopicum* and *Doodia aspera*, and shrubs with softer leaves, such as *Breynia oblongifolia* and *Polyscias sambucifolius*.

Mesic shrubs may line shallow water courses but 'rainforest-type' understorey rarely occurs on the shale soils, as the deep, sheltered gullies required for the best development of these species cut through the thin shale capping to the low nutrient Hawkesbury Sandstone soils below. 'Rainforest-type' gully vegetation in the area is therefore generally on sandstone though this may be enriched by shale material washed down from the ridges. On the shale soils there were patches of wetter understorey on sheltered hillsides, but localised rainforest understorey patches only occur at Brush Farm at Eastwood where an unusual combination of rich soils, unusually deep, sheltered gullies, and a high rainfall allowed rainforest species to survive. Species here include *Acmena smithii*, *Cryptocarya glaucescens* , *Guioa semiglauca*, *Schizomeria ovata*, *Rhodamnia rubescens* and *Euodia micrococca* (Coveny a, Broadbent & Buchanan 1984, Benson 1986b).

Blue Gum High Forest was an important resource to the timber-getters who cut out much of the valuable Blackbutt and Blue Gum in the nineteenth

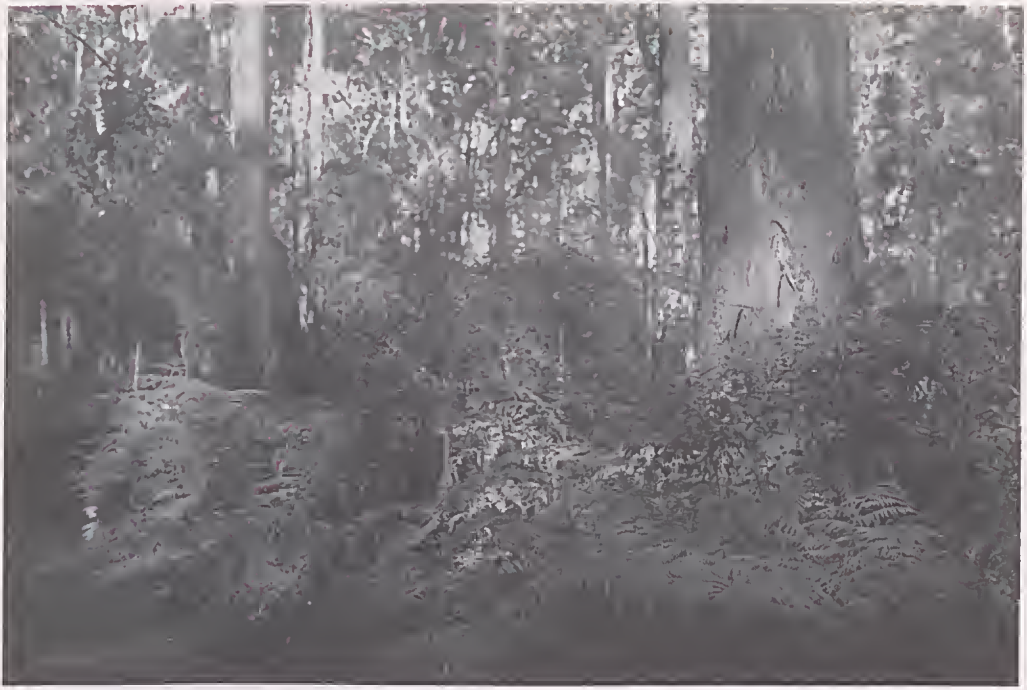


Figure 5. Remnant Blue Gum High Forest, map unit 6b, with *Eucalyptus saligna* at Dalrymple–Hay Nature Reserve, St Ives.

century (Hawkins 1994). Clearing and agricultural development led to dairy farms and orchards and then suburban development. Most of Sydney's Blue Gum High Forest has now been destroyed; Benson and Howell (1990b) estimated that only 0.9% of the original 11 000 ha found in the County of Cumberland remained in 1980). There are still some small remnants. In particular, in two reserves, Dalrymple Hay Nature Reserve at St Ives (Benson & Keith 1984a) and Ludovic Blackwood Memorial Sanctuary at Beecroft (Buchanan 1977, 1978), and in a number of smaller areas, such as Sheldon Forest, Turramurra; Darvall Park, Denistone (Coveny e); Brush Farm Park, Eastwood where there is an important remnant of rainforest (Coveny a, Broadbent & Buchanan 1984, Benson 1986b); Observatory Park, Beecroft; and Edna May Hunt Reserve, Eastwood (Benson 1979b). In addition, patches too small to map at the present scale [may] persist on roadsides or creek edges; it is important to protect these as they add to the areas of scarce habitat available for perpetuation of the forest's species.

Along creeks and drainage lines where remnants of this community still persist, there is often dense exotic weed growth invading and crowding out the native species. *Ligustrum sinense* and *L. lucidum* (Privet species) are the main culprits, while *Tradescantia albiflora* (Wandering Jew) is another major problem species. This ground-cover plant smothers native ground species, prevents seedling recruitment and is very difficult to eradicate. The most effective control in bushland areas appears to be hand-weeding and careful herbicide use. Many native understorey species can persist as propagules in the soil, able to re-establish when conditions for germination and regrowth are favourable.

Map Unit 6c

Glen Forest

Small volcanic necks or diatremes are scattered throughout the Sydney region, about 25 being shown on the Sydney 1:100 000 geology map (Herbert 1983). These sites have higher-nutrient soils than surrounding areas (Chapman & Murphy 1989) and their vegetation generally contrasts markedly with that on the adjacent sandstone or shale soils. Where the surrounding rock is low-nutrient sandstone these differences are particularly distinctive because of the differences in soil nutrients, and because many such diatremes often occur in sheltered valley positions. Unfortunately most natural vegetation on diatremes in the immediate Sydney area has been destroyed, either because their fertile soils were cleared for agriculture, or because the basaltic rocks, a convenient source of blue metal aggregate, have been extensively quarried. Remnant diatreme vegetation indicates that considerable local differences in vegetation composition occurred between sites, mainly as a result of variations in soil type and exposure conditions; two sub-units are recognised below.

i) Tall open-forest: *Eucalyptus saligna*

Eucalyptus saligna dominated vegetation, very similar to the Blue Gum High Forest of the North Shore (map unit 6b), grew on high-nutrient volcanic soils under similar high rainfall conditions (1200–1400 mm p.a.). Old Mans Valley at Hornsby, probably the largest diatreme in the area, has been extensively quarried for blue metal aggregate, but remnant vegetation on nearby Joes Mountain in Berowra Valley Bushland Park (too small to map at 1:100 000 scale) has *Eucalyptus saligna* as the dominant tree species with less frequent trees of *Eucalyptus pilularis* and *Angophora floribunda*. Native understorey species include *Calochlaena dubia*, *Blechnum cartilagineum*, *Adiantum aethiopicum*, *Pteridium esculentum*, *Smilax australis*, *Pandorea pandorana* and *Poa affinis* (Smith & Smith 1990). Weeds constituted 14% of the species recorded in the survey plot including *Lonicera japonica*, which was codominant with *Calochlaena* in the dense fern layer, and *Ligustrum lucidum*, *Ligustum sinense* and *Cinnamomum camphora* that were codominant in the shrub and low tree layers.

Similar high rainfall vegetation probably occurred on other diatremes such as at Browns Field (South Turramurra Environment Protection 1980), Dundas, Burwood and Lugarno. Volcanic necks in the Blue Mountains with similar vegetation are known as Glens e.g. Murphys Glen, Tobys Glen (Keith & Benson 1988).

ii) Tall open-forest: *Eucalyptus agglomerata–Angophora floribunda*

In Ku-ring-gai Chase, the amphitheatre-shaped valley of Campbells Crater contains tall open-forest to open-forest with trees 15–35 m tall with a mid-dense canopy cover. On the slopes of the crater the understorey is shrubby but the floor supports small trees, palms and tree ferns with a ground cover of monocotyledons and ferns. Vines are common (Thomas & Benson 1985a). Main tree species are *Eucalyptus agglomerata, Angophora floribunda, Allocasuarina torulosa,* also with *Angophora costata* and *Eucalyptus umbra*. Small trees include *Acacia floribunda*, *Synoum glandulosum* and the palm *Livistona australis*. Understorey species include shrubs; *Pultenaea flexilis*, *Prostanthera denticulata*, *Astrotricha floccosa*, and ground species; *Dianella caerulea*, *Oplismenus imbecillis*, *Calochlaena dubia*, *Hypolepis muelleri*, *Cyathea australis*, *Pteridium esculentum*, *Pseuderanthemum variabile*, *Hydrocotyle acutiloba*, *Goodenia ovata*, *Helichrysum elatum*, *Cissus hypoglauca*, *Smilax australis*, *Pandorea pandorana* and *Cayratia clematidea*.

At Campbells Crater variation relates to slope, soil and aspect. The understorey changes between the sides and the floor of the crater. On the sides a sandy topsoil lies over a clay sub-soil and this tends to support a denser shrub layer than the hard clay soil on the crater floor. The lower south-facing slope of the crater has a dense fern understorey, while the east- and north-facing slopes have a more open understorey. Weed infestation is heavy on the crater floor where the soil is more fertile. Species that are absent or uncommon elsewhere in Ku-ring-gai Chase National Park are *Eucalyptus agglomerata*, *Toona ciliata*, *Seringia arborescens*, *Asterolasia correifolia*, *Rulingia dasyphylla* and *Rubus rosifolius*.

Remnants of similar vegetation occur at Dillons Crater in Brisbane Water National Park (Benson & Fallding 1981) and Peats Crater in Muogamarra Nature Reserve, though much of the volcanic areas have been cleared. Blanch and Marramarra Craters in Marramarra National Park, and one north of Fiddletown (Smith & Smith 1990), probably still have similar vegetation.

Volcanic dykes also occur, but are generally too narrow to support a distinct plant community, though understorey species may show local variations indicative of the more clayey, higher-nutrient soils. Sanders (1983) found that wide variation occurred within the vegetation associated with dykes and that soil and topographic position were important factors for species distribution; soil movement downslope from the dyke accounts for 'dyke' vegetation growing on sandstone. On soils associated with a dyke at West Head is open-forest with trees of *Eucalyptus paniculata, Eucalyptus umbra, Angophora floribunda, Eucalyptus scias* subsp. *scias, Syncarpia glomulifera* and *Allocasuarina torulosa*. Six species were found to characterise the vegetation on the ridge: *Macrozamia spiralis, Xylomelum pyriforme, Lomatia silaifolia, Pultenaea daphnoides, Notelaea ovata* and *Breynia oblongifolia;* and three to characterise the basalt soil in the creek; *Cissus hypoglauca, Doodia aspera* and *Livistona australis*.

Map Unit 9d

Transition Forest

Open-forest: *Eucalyptus fibrosa–Eucalyptus moluccana–Melaleuca decora*

Found in the Bankstown–Regents Park area, small patches of this vegetation still exist around Duck River, Auburn and Rookwood Cemetery, occurring on lower rainfall Wianamatta Shale (rainfall at Lidcombe is about 800 mm p.a.) on soils often associated with ironstone gravels, generally red podzolics or relict red podzolics. These are of low fertility and support vegetation with a shrubby understorey rather than the grasses that are characteristic of the more fertile soils of the Cumberland Plain with a similar rainfall. Floristically this vegetation is similar to the open-forest on transitions from Wianamatta Shale to the Tertiary alluvium in the Castlereagh–Penrith area and mapped (map unit 9d) on the Penrith Sheet (Benson 1992a), although here it is on Wianamatta Shale. It is likely that similar soil and drainage conditions here support this vegetation.

Structure is open-forest with an understorey ranging from a dense shrub layer about 3 m high to open and grassy with scattered shrubs. In the Bankstown–Regents Park area the main canopy tree species are *Eucalyptus fibrosa* and *Eucalyptus moluccana. Eucalyptus longifolia* and *Eucalyptus globoidea* occur sporadically and do not appear to be in any particular habitat. *Eucalyptus tereticornis* is found in the lower rainfall areas generally on lower hill slopes and depressions. *Syncarpia glomulifera* is usually found in higher-rainfall areas. *Angophora bakeri* was recorded only from near Duck River at Auburn, and *Eucalyptus parramattensis* from Bass Hill. Dense shrubs are found along watercourses. *Melaleuca decora* is common in depressions and on poorly-drained flats. *Melaleuca styphelioides* is less common and found along creek channels. Other shrub species along creeks include *Rapanea variabilis* and *Breynia oblongifolia*. Shrubs also predominate on dry gravelly rises. Of the larger shrubs *Bursaria spinosa, Melaleuca nodosa* and *Acacia decurrens* are most common. Smaller shrubs include *Lissanthe strigosa, Daviesia ulicifolia, Dillwynia juniperina, Callistemon pinifolius, Acacia pubescens* and *Dodonaea triquetra*. Ground plants, grasses such as *Themeda australis* and *Aristida vagans*, sedges such as *Lepidosperma laterale* and *Lomandra longifolia* and herbs such as *Vernonia cinerea, Pratia purpurascens* and *Hardenbergia violacea* are interspersed with the shrubs or are more conspicuous on the sides of gravelly ridges.

Price (1979) studied the remnants of native vegetation in the Auburn area. He found that the original forest structure at Duck River and Rookwood Cemetery has been largely modified by fire, since european settlement, into grasslands, *Melaleuca* and eucalypt scrub, and low woodland. Grasslands dominated by *Themeda australis* occur in areas cleared long ago and little interfered with other than by regular burning. Other species associated with them *include Patersonia longifolia, Hypoxis hygrometrica, Xanthorrhoea* and *Lomandra* species and ground orchid species of *Diuris, Microtis* and *Thelymitra*.

Melaleuca and eucalypt scrub is common on land that has been partly cleared or left to recolonise naturally. *Melaleuca decora, Melaleuca nodosa* and *Melaleuca styphelioides* are the most abundant shrub species here and may be accompanied by small trees of *Eucalyptus fibrosa, Eucalyptus moluccana, Eucalyptus resinifera, Angophora bakeri, Syncarpia glomulifera* and *Eucalyptus longifolia*. Depending on the density of the *Melaleuca* canopy, there may be scattered herbs or open grassy places in between. Herb species include *Stylidium graminifolium, Lomandra* species, *Dianella* species, *Calotis cuneifolia* and *Vernonia cinerea*. Shrubs of open places such as *Daviesia ulicifolia, Dillwynia juniperina, Indigofera australis, Pimelea linifolia, Olearia microphylla, Ozothamnus diosmifolius, Bursaria spinosa, Callistemon linearis, C. pinifolius*, and the low-growing *Melaleuca* species, *Melaleuca erubescens* and *Melaleuca thymifolia*, are usually more common than species found in more shady habitats, such as *Polyscias sambucifolius*, *Pittosporum undulatum* and *Breynia oblongifolia*. Fire modifies the structure and floristics of these *Melaleuca* scrubs. When the canopy is opened to light, short-lived herbs such as *Pelargonium inodorum*, *Polymeria calycina*, *Senecio hispidulus* and shrub species *Cassinia arcuata*, *Ozothamnus diosmifolius*, *Olearia microphylla*, *Pimelea linifolia*, *Pultenaea villosa*, *Acacia falcata* and *Acacia longifolia*, establish.

The understorey of shrubs and tall herbs in the low woodland remnants include shade-tolerant or moisture-requiring species, many of them having seeds that are probably spread by birds. Species able to survive fires by suckering, such as *Breynia oblongifolia*, *Phyllanthus gasstroemii*, *Rapanea variabilis*, *Notelaea longifolia* and the exotic weed species *Asparagus officinalis* and *Myrsiphyllum asparagoides* are most abundant; other species include *Glochidion ferdinandi*, *Pittosporum undulatum*, *P. revolutum* and *Omalanthus populifolius*. For the Auburn area Price recorded 292 native species, a considerable number in view of the degree of disturbance the area has suffered.

This vegetation occurs on very poor agricultural soils. It remained largely undisturbed until the expansion of suburban development in the Bankstown–Liverpool district following the Second World War. Remnants still survive on State, Commonwealth and local council land. Probably the best example in the map area is along Duck River at Auburn. There are also remnants at Rookwood Cemetery, Carysfield Park at Bass Hill, Norfolk Reserve, Greenacre, and Airport and Ashford Reserves, Milperra. A nationally listed rare species, *Acacia pubescens*, is almost completely restricted to this community and has been recorded at a number of sites in the area including Carysfield Park and Rookwood Cemetery and along the railway line near Punchbowl and Yagoona. Trees of *Eucalyptus longifolia* with *Melaleuca decora* still survive beside Parramatta Road at its intersection with Hill Road, Granville. These are significant because they are the last naturally occurring native trees along Parramatta Road between Sydney and Parramatta.

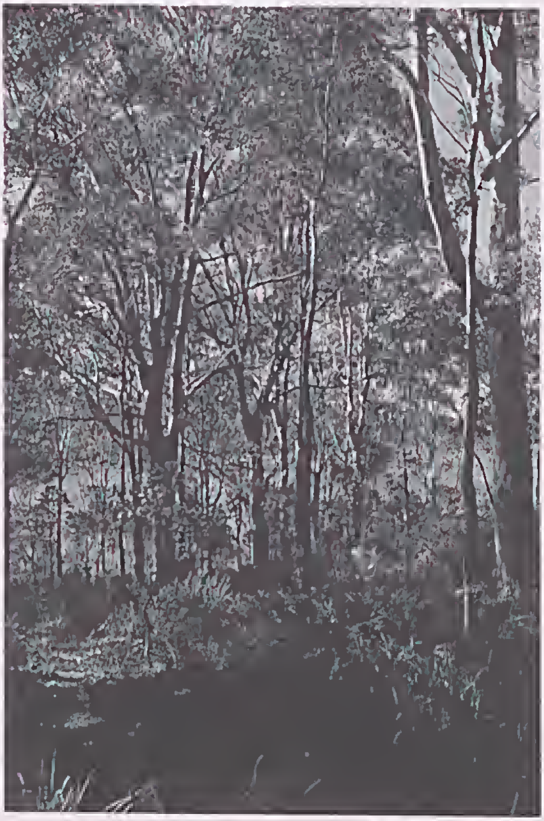


Figure 6. *Eucalyptus maculata* **open-forest, map unit 9g(ii), on the lower slopes at Elvina Bay, western Pittwater.**

Map unit 9g
Spotted Gum–Blackbutt Forest

Spotted Gum–Blackbutt Forest is a very extensive and varied community on the Gosford map sheet area (Benson 1986a). It is an important component of the forestry activities of the Wyong district and extends south along the coast into the Bouddi and Warringah Peninsulas on the Sydney map sheet, where *Eucalyptus maculata*, Spotted Gum, is particularly conspicuous. Here, spotted Gum–Blackbutt Forest is found along the entrance to Brisbane Water between Wagstaff and The Rip (McRae 1990), along the Warringah Peninsula, on Scotland Island, and on the foreshores of Pittwater (Pidgeon 1937; Thomas & Benson 1985a). It is found on lower hillslopes on the Narrabeen Group–Terrigal Formation and coastal occurrences of the Newport Formations (interbedded laminite, shale and sandstones), on shallow to deep lithosols and podzolics of the Watagan Soil Landscape (Chapman & Murphy 1989). Annual rainfall here is up to 1500 mm with no winter frosts or seasonal drought (Kartzoff 1969). A number of sub-units can be recognised.

i) Open-forest: *Eucalyptus gummifera–Eucalyptus maculata–Eucalyptus pilularis*

Occurs mainly in the Wyong area on the Gosford map sheet (Benson 1986a).

ii) Open-forest: *Eucalyptus maculata–Eucalyptus paniculata*

Eucalyptus maculata, Spotted Gum, is the most characteristic tree, e.g. making up 46% of a sample of 150 trees in Hudson Park, Avalon (Smith & Smith 1993), forming an open-forest 15–30 m high with a mid-dense canopy cover. Associated trees at Hudson Park are *Angophora costata* (16%), *Eucalyptus gummifera* (13%), *Eucalyptus umbra* (9%), *Eucalyptus punctata* (6%), *Eucalyptus paniculata* (4%), *Syncarpia glomulifera* (3%), *Eucalyptus botryoides* (2%) and *Angophora floribunda* (1%). Small trees include *Allocasuarina torulosa*, *Glochidion ferdinandi* and *Livistona australis*. The understorey varies according to aspect. On dry sites there is a very sparse small tree and shrub layer with *Allocasuarina littoralis*, *Dodonaea triquetra*, *Platylobium formosum*, *Macrozamia communis* and *Pultenaea flexilis*, a mid-dense low shrub layer and an open ground cover of herbs and graminoids. In sheltered aspects the small tree layer is denser, including *Elaeocarpus reticulatus* and *Pittosporum undulatum*, there are few low shrubs, and ferns such as *Adiantum aethiopicum* and *Doodia caudata*, and vines such as *Cissus hypoglauca*, *Pandorea pandorana*, *Cayratia clematidea*, *Geitonoplesium cymosum* and *Eustrephus latifolius* may form a 'rainforest type' understorey. Small rainforest trees may occur, particularly on the Warringah Peninsula, including *Diospyros australis*, *Synoum glandulosum*, *Cassine australis* var. *australis*, *Euodia micrococca*, *Commersonia fraseri* and *Alphitonia excelsa*. *Livistona australis* is locally abundant around Bilgola.

Floristic lists have been compiled for Angophora Reserve and Hudson Park, Avalon (Table 3, Smith & Smith 1993), the National Trust's Burley Griffin Lodge at Avalon (Buchanan 1979b), western Pittwater (Thomas & Benson 1985a), and Loquat Valley, Bayview (Costin 1986).

iii) Woodland: *Eucalyptus umbra–Eucalyptus paniculata*

Related vegetation is found on the south-eastern side of the Bouddi Peninsula on slopes running from the main ridge to the coast (McRae 1990). Here the slopes are steep, from 10° to 35°, the aspect varies around south-east and there is always some degree of exposure to coastal winds and saltspray. Where the coastal exposure is greatest, the structure is reduced to a tall shrubland in which the canopy merges with the shrub layer. Elsewhere it is woodland structure.

The main tree species, *Eucalyptus umbra*, *Eucalyptus paniculata*, *Angophora costata* and *Syncarpia glomulifera* form a layer that varies from a height of 25 m and a cover of 25% to a height of 3 m with 10% cover, with increasing exposure. The shrub layer (3 m high with 20% cover) has a variable composition with common species including *Macrozamia communis*, *Dodonaea triquetra* and *Pultenaea flexilis*. The tall ground layer (1.5 m high with 30% ground cover) is dominated by *Lomandra longifolia*, *Imperata cylindrica*, *Gahnia melanocarpa* and *Pteridium esculentum*. The variablility in all strata is due to aspect and soil, the latter arising from the variable nature of the parent rocks (McRae 1990).

iv) Open-forest: *Archontophoenix cunninghamiana*

On slopes below Mt Bouddi are deep gullies with marginal rainforest dominated by Bangalow Palm, *Archontophoenix cunninghamiana*, with scattered *Eucalyptus deanei* and *Allocasuarina torulosa* (McRae 1990). Structurally this is open-forest with the trees up to 30 m high and reaching 60% canopy cover. There is a small tree layer, 10 m high, with Cabbage Palm, *Livistona australis*, *Duboisia myoporoides*, *Glochidion ferdinandii*, *Ficus coronata*, *Pittosporum undulatum*, *Schizomeria ovata*, and *Acmena smithii*, scattered shrubs including *Notelaea venosa*, *Wilkiea huegliana*, *Eupomatia laurina* and *Citriobatus pauciflorus*, and ground cover species including *Cissus antarctica*, *Rubus moorei*, *Morinda jasminoides*, *Gymnostachys anceps* and *Blechnum cartilagineum*. *Lantana camara* is usually abundant in the surrounding eucalypt woodland and in time could increase from its currently isolated thickets within the palm-forests.

Map unit 9h

Narrabeen Slopes Forest

Narrabeen Slopes Forest is particularly characteristic of the foreshores of Broken Bay and Pittwater (communities 6 and 7 of Thomas & Benson 1985a) and along the Hawkesbury River and its tributaries, Mangrove and Mooney Mooney Creeks (Benson & Fallding 1981; Benson 1986a). Similar vegetation is found on lower slopes of the islands of Broken Bay — Spectacle Island (Webb 1981), Bar Island (Benson 1984), Milson Island (Cleland 1914) Lion Island (Benson 1981a), Long Island (Coveny & McDougall 1990) and Dangar Island, and Scotland Island in Pittwater. All of these islands, with the exception of Bar Island, have Hawkesbury Sandstone vegetation (map unit 10ar) on their crests.

Narrabeen Slopes Forest is found on strata of the Narrabeen Group–Newport Formation (interbedded shale, laminite and medium-grained quartz sandstone) that outcrop on lower slopes and hillsides below cliffs and ridges of Hawkesbury Sandstone. Vegetation structure and floristic composition are particularly influenced by aspect. South-facing slopes are steeper, cooler and moister than north-facing slopes, which are less steep, but drier and more sunny. Two sub-units are recognised.

i) Open-forest: *Eucalyptus deanei–Angophora floribunda*

Sheltered south-facing aspects generally have open-forest with trees of *Eucalyptus deanei* and *Angophora floribunda* and may be associated with pockets of rainforest. This is found mainly on the northern side of Broken Bay in Mooney Mooney and Mullet Creeks on the Gosford map sheet (Benson 1986a), with one small occurrence at the southern end of Brisbane Water National Park and near Patonga (community 2B of Benson & Fallding 1981). There is generally a mesic understorey with climbers — *Hibbertia scandens*, *Hibbertia dentata*, *Cissus hypoglauca*; ferns — *Calochlaena dubia*, *Doodia aspera*, *Pteridium esculentum*; and other ground species — *Themeda australis*, *Imperata cyclindrica*, *Hydrocotyle* and *Lomandra* species.

ii) Open-forest: *Angophora floribunda–Allocasuarina torulosa*

On dry north- to west-facing slopes and on slopes open to sea breezes, open-forest is characterised by *Angophora floribunda*, *Eucalyptus punctata* and *Allocasuarina torulosa*. This occurs on the eastern sides of Mooney Mooney and Mullet Creeks in Brisbane Water National Park (community 2A of Benson & Fallding 1981), but is most common on the southern shore of Broken Bay on the foreshores of Cowan Creek, Coal and Candle Creek, Smiths Creek and the Hawkesbury River (Thomas & Benson 1985a, Community 7). Here it is from 15–25 m high with a mid-dense to open canopy cover. The main tree species are *Angophora floribunda*, *Eucalyptus punctata* and *Allocasuarina torulosa*, with *Eucalyptus botryoides*, *Eucalyptus umbra* and *Eucalyptus paniculata*. The understorey is usually dry with an open shrub layer and a ground cover dominated by grasses and herbs. Shrubs include *Pultenaea flexilis*, *Acacia ulicifolia*, *Astrotricha floccosa*, *Cassinia denticulata*, *Playsace linearifolia*, *Prostanthera denticulata* and *Persoonia linearis*. Grasses include *Entolasia* species and *Themeda australis*, and may predominate in frequently burned sites. On very sheltered aspects there may be moister species such as *Synoum glandulosum* and *Calochlaena dubia*.

Thomas and Benson (1985a) indicate that *Eucalyptus botryoides* and *Eucalyptus paniculata* occur with *Angophora floribunda* along the foreshores of Western Pittwater from McCarrs Creek to West

Head on deeper, heavier soils in sheltered sites (described as their community 6). This variant commonly has an understorey of *Calochlaena dubia* and vines, particularly *Smilax australis* and *Geitonoplesium cymosum*, and has been included within this map unit. *Eucalyptus botryoides* may extend beyond the Narrabeen Group soils and is commonly found with *Angophora costata* on coastal sandstone headlands but rarely occurs away from the coast. *Eucalyptus maculata* rarely occurs in this unit. However, it is found around Pittwater where Narrabeen Slopes Forest is similar to and intergrades with Spotted Gum–Blackbutt Forest (map unit 9g).

Map unit 9o

Turpentine–Ironbark Forest

Open-forest: *Syncarpia glomulifera–Eucalyptus paniculata*

Turpentine–Ironbark Forest was the characteristic forest vegetation of the inner western part of Sydney from St Peters west to Peakhurst and sporadically as far as Lansdowne. It occurred on Wianamatta Shale, on shallow to deep podzolic soils of the Blacktown Soil Landscape (Chapman & Murphy 1989). It was also found north of the Parramatta River, from Ryde to Castle Hill and along shale-capped ridges around Glenorie and Arcadia, and on the transition zone between the Wianamatta Shale and the underlying Hawkesbury Sandstone, particularly on soils formerly known as the Hammondville Association (Walker 1960).

Turpentine–Ironbark Forest was first described by Phillips (1947) as a sub-association (*Eucalyptus pilularis–Eucalyptus resinifera*) of her *Eucalyptus pilularis–Eucalyptus saligna* Association, but is distinctive enough to map and discuss as a separate unit. With a moderate rainfall of between 900 mm and 1100 mm per annum, the vegetation, an intermediate, is part of the shale-vegetation gradient from the higher-rainfall Blue Gum High Forest (*Eucalyptus pilularis–Eucalyptus saligna* tall open-forest, map unit 6b), to the low rainfall Grey Box Woodland (*Eucalyptus moluccana–Eucalyptus tereticornis* woodland, map unit 10c, Benson 1992) further west on the Cumberland Plain.

Most of the Turpentine–Ironbark Forest has now gone, having been replaced by suburbs in the nineteenth and early twentieth centuries (Benson & Howell 1990a). Part of the Inner Western area, north of the Cooks River, in the Ashfield–Canterbury area was designated the *Kangaroo Ground* by Watkin Tench (Tench 1979), and was sought for early settlement. Collins (1798) wrote: 'The lieutenant-governor [Grose] proposing to open and cultivate the ground commonly known by the name of the Kangaroo Ground, situate to the westward of the town of Sydney between that

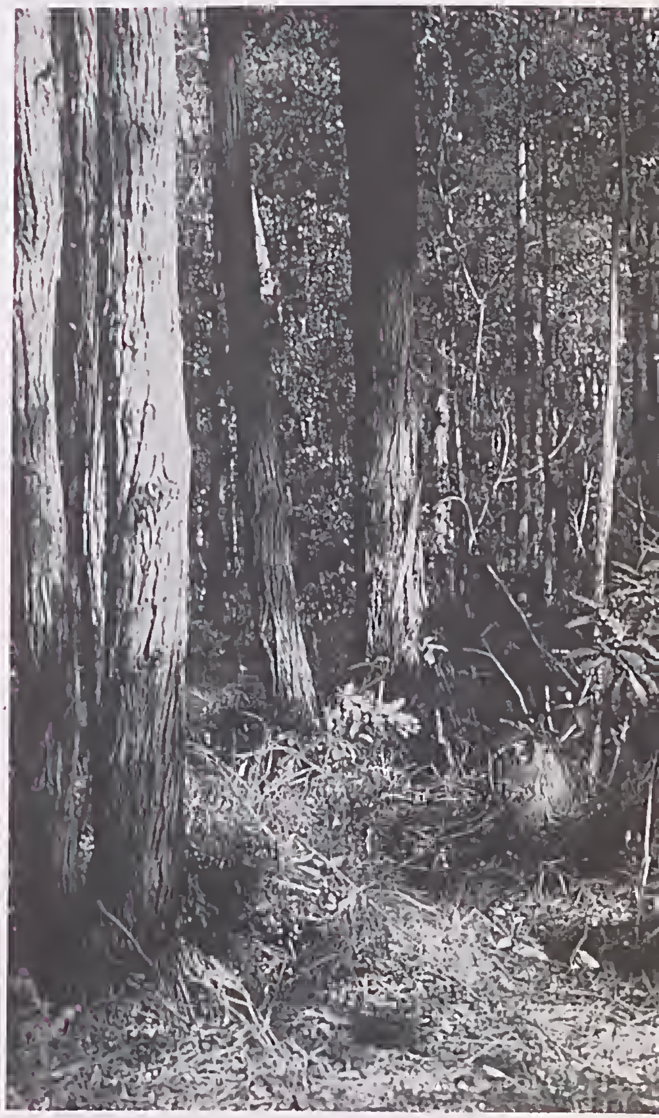


Figure 7. There are only a few surviving remnants of Turpentine–Ironbark Forest, map unit 9o, such as here at Fagan Park, Galston.

settlement and Parramatta, a gang of convicts was sent from the latter place for that purpose. The soil here was much better for agriculture than that immediately adjoining to the town of Sydney, and the ground lay well for cultivation; but it had hitherto been neglected, from its being deficient in the very essential requisite of water; on which account Parramatta had been preferred to it.'

This area would appear to have been eucalypt open-forest or woodland with an open understorey suitable for kangaroo habitat (Pratten 1993). There would, however, have been local variation in vegetation composition, and other early writers mention 'heavy timber and brush' (i.e. a dense understorey of shrubs). Peter Cunningham (1827) described Parramatta Road between Annandale and Ashfield bordered by land '... thickly covered with heavy timber and brush, the soil being usually a poor shallow reddish or ironstone clay, the contemplation whereof presents but little pleasure to the agriculturalist'.

Characteristic tree species were probably *Syncarpia glomulifera*, the Turpentine, and *Eucalyptus paniculata*, the Grey Ironbark. These would have been accompanied by a range of other species including *Eucalyptus globoidea*, *Eucalyptus punctata*, *Eucalyptus resinifera*, *Eucalyptus pilularis* and *Angophora floribunda*. Remnant trees of *Syncarpia glomulifera*, *Eucalyptus pilularis*, *Eucalyptus resinifera* and *Eucalyptus globoidea* still survive in Ashfield (Pratten 1993) and there are old herbarium collections of *Eucalyptus siderophloia* from Burwood and Belmore. A notice in the Sydney Morning Herald in December 1834, advertising allotments of the Burwood estate mentions 'timber: Shingle Oak, Iron and Stringy Bark, Mahogany, Blue Gum' etc. 'Blue Gum' here may refer to *Eucalyptus saligna*, which may have occurred locally in gullies or depressions, or *Eucalyptus tereticornis*, which may also have occurred.

Estimated canopy heights in remnant stands north of the Harbour, surveyed in the 1970s, ranged from 10 to 20 m with canopy cover from 30 to 67%, all figures characteristic of open-forest formation (D. Benson unpub. data). Most of these remnants are on the least favourable agricultural sites and have generally been logged, grazed and burnt at varying intensities. Plant densities for these stands, (mean = 719 ± 383 plants/ha), indicate a considerable amount of sapling and small tree regeneration. *Syncarpia glomulifera* was the most important species, accounting for 16% of total basal area and 35% of total plant density, probably because of its ability to withstand disturbance by resprouting, and its slow growth. Seven other tree species each accounted for between 4 and 14% of total basal area and between 2 and 10% of total plant density. A further eight species were recorded contributing to total site basal area.

The understorey was variously shrubby or grassy. Common shrub species in remnants now are *Dodonaea triquetra*, *Polyscias sambucifolia* and *Acacia falcata*, and grass and herb species include *Themeda australis*, *Echinopogon caespitosus*, *Pseuderanthemum variable* and *Pratia purpurascens*. In the early 1840s Mrs Charles Meredith described the forest at Homebush and mentions native species including *Hardenbergia violacea*, *Kennedia rubicunda*, *Pandorea pandorana* and other species likely to be *Oxylobium scandens*, *Dillwynia juniperina*, *Daviesia ulicifolia*, *Platylobium formosum*, *Viola hederacea*, *Wahlenbergia* species, *Lissanthe strigosa* and *Leucopogon juniperinus* (Meredith 1844, quoted in Benson & Howell 1990a). Most of these species can still be found near Homebush Bay, where an important remnant of this vegetation survives in land used for storage of naval munitions (Clarke & Benson 1988; Kachka 1993), or in the Yaralla Bushland in nearby Concord Municipality (Benson 1983).

There is also a small yet important remnant of native vegetation on the banks of the Cooks River at the end of Third Avenue, Campsie (Benson 1992b). The vegetation has patches of scrub, grassland and some trees. Most of the vegetation is of plants native to the site, many of which are growing very vigorously. In particular, in some of the more open areas there is a rich flora of ground cover species in particular grasses and prostrate small shrubs, such as *Astroloma humifusum*, *Calotis cuneifolia* and *Goodenia hederacea*. There was a patch of the orchid *Microtis unifolia* and some very impressive clumps of *Xanthorrhoea media*. Populations of *Calotis cuneifolia*, *Hibbertia serpyllifolia* and *Oxylobium ilicifolium* are probably the only natural occurrences surviving in inner western Sydney. Patches of shrubs include *Kunzea ambigua*, *Leptospermum trinervium* and shrubby trees of *Syncarpia glomulifera*. One of the reasons for the vigorous native plant growth is that the natural soils are essentially unmodified and have not received nutrients in run-off from other areas. In comparison, adjacent areas with dumped soil have a significant number of weeds. This vegetation is the only remnant of Turpentine–Ironbark Forest vegetation for many kilometres, and is virtually the only remnant of native vegetation on the banks of the Cooks River. The only other native vegetation in the Cooks River valley is along Wolli Creek, in Girrahween Park, associated with outcropping sandstone and having a different species composition from this remnant on shale at Campsie.

On the northern side of the Harbour remnants occur at Ryde in Wallumatta Nature Reserve (Benson 1984, see below) and Fagan Park at Galston (Benson & Keith 1984b) including a good local stand of *Eucalyptus acmenoides*, a species which reaches its southern distributional limit at the Parramatta River — a few trees survive in Maze Park, West Ryde.

Turpentine–Ironbark Forest vegetation extended onto the transition zone between the shale and the underlying Hawkesbury Sandstone, on soils formerly known as the Hammondville Association (Walker 1960). Some of this transitional vegetation still survives as narrow edgers to cleared land on private property and on the margins of sandstone bushland reserves in northern Sydney, where there are remnants of shale overlying sandstone, e.g. Pennant Hills Park, Lane Cove National Park (formerly State Recreation Area) (Clarke & Benson 1987) and Garigal National Park (formerly Davidson State Recreation Area), Ku-ring-gai Chase National Park (Thomas & Benson 1985a), Marramarra National Park, and a number of Council parks. These patches are generally too small to map at the present scale. The vegetation of these areas differs from that on the deeper shale by including sandstone species. Structure is generally open-forest and tree species may be *Syncarpia glomulifera*, *Eucalyptus punctata*, *Eucalyptus paniculata* and *Eucalyptus globoidea*.

Protection of all small remnants of this shale-based flora is important since many of the smaller-growing species in particular are becoming rare, and many of the sites are in very vulnerable positions close to urban development and susceptible to weed invasion and nutrient-enriched run-off. Because shale areas are small and frequently on the margins of reserves, they may need particular and careful management.

Map unit 9sf
Duffys Forest

Open-forest: *Eucalyptus sieberi–Eucalyptus capitellata–Eucalyptus gummifera–Angophora costata*

On sandstone ridgetops in the Duffys Forest–Terrey Hills area are shale remnants from lenses within the Hawkesbury Sandstone (Herbert 1983), often with characteristic ironstone gravels, referred to as 'laterite' cappings. Soils are part of the Somersby Soil Landscape (Chapman & Murphy 1989), moderately deep yellow earths and deep red earths overlying laterite gravels and clays. A distinctive open-forest vegetation occurs on these.

At Duffys Forest, open-forest is 7–18 m high with a mid-dense canopy with trees of *Eucalyptus sieberi, Eucalyptus gummifera, Eucalyptus oblonga, Eucalyptus haemastoma* and *Angophora costata* (Benson 1974, 1979a; Thomas & Benson 1985a: community 10B). The understorey is of mid-dense shrubs often with emergent taller shrubs with a ground cover of low shrubs and monocots. Understorey species include *Telopea speciosissima, Xylomelum pyriforme, Ceratopetalum gummiferum, Banksia spinulosa, Persoonia levis, Micrantheum ericoides, Leptospermum trinervium, Pimelea linifolia, Acacia myrtifolia, Boronia pinnata* and *Cyathochaeta diandra*. Variation appears related to soil depth and type. Deeper soils carry more *Eucalyptus sieberi* with the occasional *Eucalyptus pilularis* and *Syncarpia glomulifera* and the understorey shrub *Bossiaea obcordata*, while thinner soils tend to support more sandstone woodland species. The central part of the original 'Duffys Forest' was cleared many years ago but Kartzoff (1969) reports that much blackbutt, *Eucalyptus pilularis*, was logged at Duffys Forest and that as a result of logging and burning, it is now extinct there, where it had been common 30 years before.

Thomas & Benson (1985a) also describe a slightly different community (community 10A) on low slope areas on shale-derived soils (possibly lateritic) and on deeper soils than the floristically similar *Eucalyptus sieberi* community. Structure is open-forest 0–17 m tall with a mid-dense canopy cover of trees of *Eucalyptus capitellata, Eucalyptus gummifera, Eucalyptus sieberi, Eucalyptus haemastoma*. The understorey has a sparse tall shrub layer, an open to mid-dense mid-height shrub

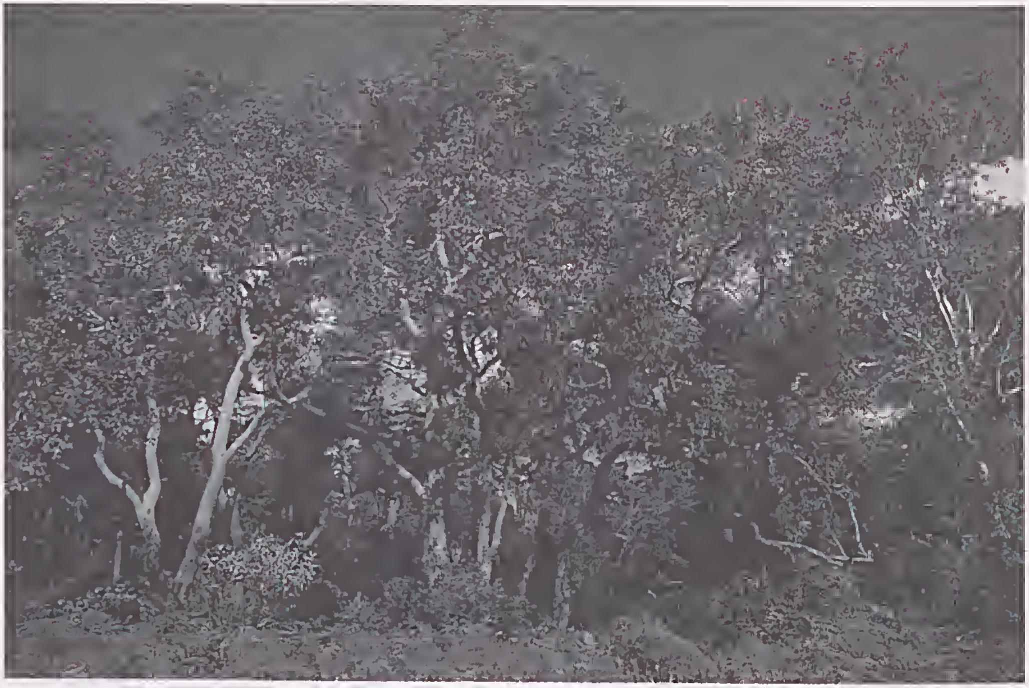


Figure 8. In the Leo Smith Reserve at Ramsgate there is an important remnant of Coastal Dune Forest, map unit 9t, with *Angophora costata* and a dense ground cover of Bracken and shrubs.

layer and an open to mid-dense ground cover of low shrubs, herbs and monocotyledons. Main species are *Ceratopetalum gummiferum*, *Persoonia levis*, *Acacia myrtifolia*, *Bossiaea obcordata*, *Banksia spinulosa*, *Lomatia silaifolia*, *Pultenaea elliptica*, *Micrantheum ericoides*, *Patersonia glabrata* and *Cyathochaeta diandra*. The shale influence on this community is distinctive and several species occur which are uncommon in the rest of the park (e.g. *Persoonia laurina*, *Pultenaea linophylla* form *b*. The threatened *Grevillea caleyi* occurs at the start of the Ryland Track. This community is very restricted in Ku-ring-gai Chase National Park. Similar vegetation also occurs at the junction of Forest Way and Mona Vale Rd, now part of Garigal National Park.

Also included in this map unit is open-forest with a very restricted distribution on remnant shale outcrops in the south of Brisbane Water National Park (mapped as community 4S, Benson & Fallding 1981). Trees here include *Eucalyptus gummifera*, *Angophora costata*, *Eucalyptus globoidea*, *Eucalyptus umbra*, *Eucalyptus punctata* and *Syncarpia glomulifera*. The shrub understorey is dominated by members of the Fabaceae family, and ground cover species include *Poa affinis*, *Entolasia stricta* and species of *Lomandra*.

Map unit 9t

Coastal Dune Forest

Open-forest: *Eucalyptus botryoides–Eucalyptus pilularis–Angophora costata*

Coastal Dune Forest occurred on the quartz sand of the Holocene beach ridges that extend along the western shore of Botany Bay, and on the northern side of Broken Bay between Pearl Beach, Umina and Woy Woy (New South Wales Department of Mineral Resouces 1983). It may also have occurred in sheltered sites on the 'marine' sands in Sydney's eastern suburbs, though most of this area appears to have had heath vegetation (Benson & Howell 1990a). Almost all has been destroyed by housing, with the exception of a small remnant on Botany Bay in the Leo Smith Reserve at Ramsgate, some low woodland with *Angophora costata* and *Eucalyptus botryoides* on the sheltered slopes of some dunes in Golf Courses at La Perouse, and a few remnants at Umina, too small to map.

Vegetation structure was originally open-forest to low woodland. *Eucalyptus botryoides*, *Eucalyptus pilularis* and *Angophora costata* appear to have been the main tree species, though *Angophora floribunda* is common in the Woy Woy occurrence.

Angophora floribunda, *Eucalyptus botryoides* and *Eucalyptus punctata* occur at Pearl Beach (Benson & Fallding (1981). The understorey was shrubby with such native species as *Banksia serrata*, *Elaeocarpus reticulatus*, *Hibbertia scandens*, *Leucopogon ericoides*, *Monotoca elliptica*, *Breynia oblongifolia*, *Glochidion ferdinandi* and *Pomax umbellata*. A species list for Leo Smith Reserve has been prepared by Benson & Keith (1985). This small area of open-forest at Ramsgate is the sole remnant of native sand vegetation of the beach ridge system (Outer Barrier) of western Botany Bay (nearby low-lying area has *Casuarina glauca* forest–Map unit 4a). It is different from the Eastern Suburbs *Banksia* Scrub of the transgressive dunes (map unit 21b), but has similarities to vegetation at Kurnell. Studies of intact vegetation on similar sand dune systems at Myall Lakes (Myerscough & Carolin 1986) demonstrate the complex nature of such vegetation systems.

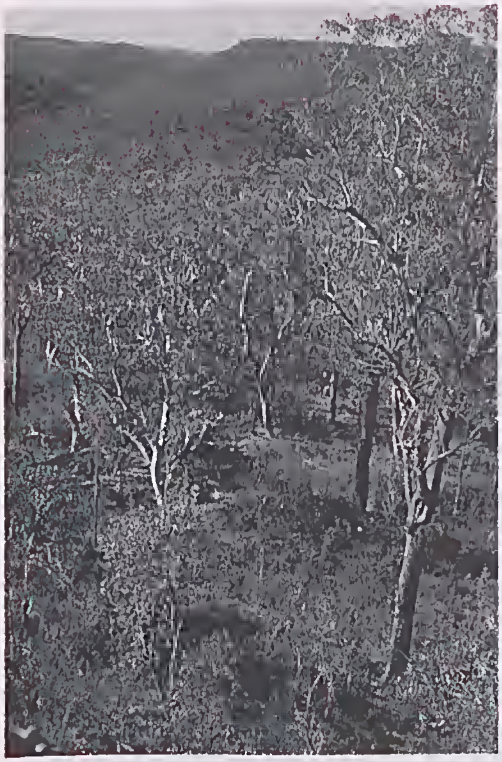


Figure 9. Some of the different habitats provided by the rugged sandstone topography are evident here in Ku-ring-gai Chase National Park — distant level ridgetops, exposed and sheltered hillsides and narrow valley floors each support different groupings of plant species.

Burges and Drover (1952) related vegetation patterns on the Holocene beach ridges between Umina and Woy Woy to increasing podzolisation and beachridge age (up to 4 000 years). Along the beach-front typical foredune colonisers were found, backed by a *Leptospermum laevigatum–Banksia integrifolia* thicket about 100 m wide. Isolated trees of *Eucalyptus botryoides* began to occur about 150 m from the beach and increased in number to form, with *Angophora floribunda*, a fairly open woodland on an area of iron podzol sands. Nearer to Woy Woy, on well-defined humus podzols, *Angophora floribunda* was replaced by *Angophora costata*. The swampy areas between the sand ridges had a range of vegetation from open water with *Typha*, to *Melaleuca quinquenervia* woodland. Remnant trees of *Angophora floribunda*, *Angophora costata*, *Eucalyptus pilularis*, *Glochidion ferdinandii* and a few conspicuous *Macrozamia communis* along the road verges around Ettalong and Umina are generally all that remains of this vegetation.

Sydney Sandstone Complex (map units 10ag and 10ar)

This widespread vegetation complex occupies extensive areas of the Hawkesbury Sandstone plateaus and associated gullies. Depending on topographic position and aspect, there is considerable local variation in floristics and structure. Thomas and Benson (1985a), mapped 12 units for Hawkesbury Sandstone in Ku-ring-gai Chase National Park. Two broad sub-units have been recognised. These are a moist forest type, generally associated with sheltered hillsides and moist gullies (map unit 10ag), and a dry woodland type, generally associated with dry plateaus and ridges (map unit 10ar). These units have been used on the Katoomba, Wallerawang and Penrith sheets but not on the Gosford and Lake Macquarie map sheet (Benson 1986a), where a composite Hawkesbury Sandstone unit (map unit 10a) was used.

Sydney Sandstone Complex (map units 10ag and 10ar) ranges from tall open-forest to low woodland and open-scrub. It corresponds with part of the Mixed *Eucalyptus* Forest Association of Pidgeon (1937, 1938). In the map units described in this paper, Map Unit 10ag is essentially Pidgeon's High Forest, Map Unit 10ar includes scrub, tree-scrub, low scrub-forest and tall scrub-forest, and Map Unit 21g includes extensive areas

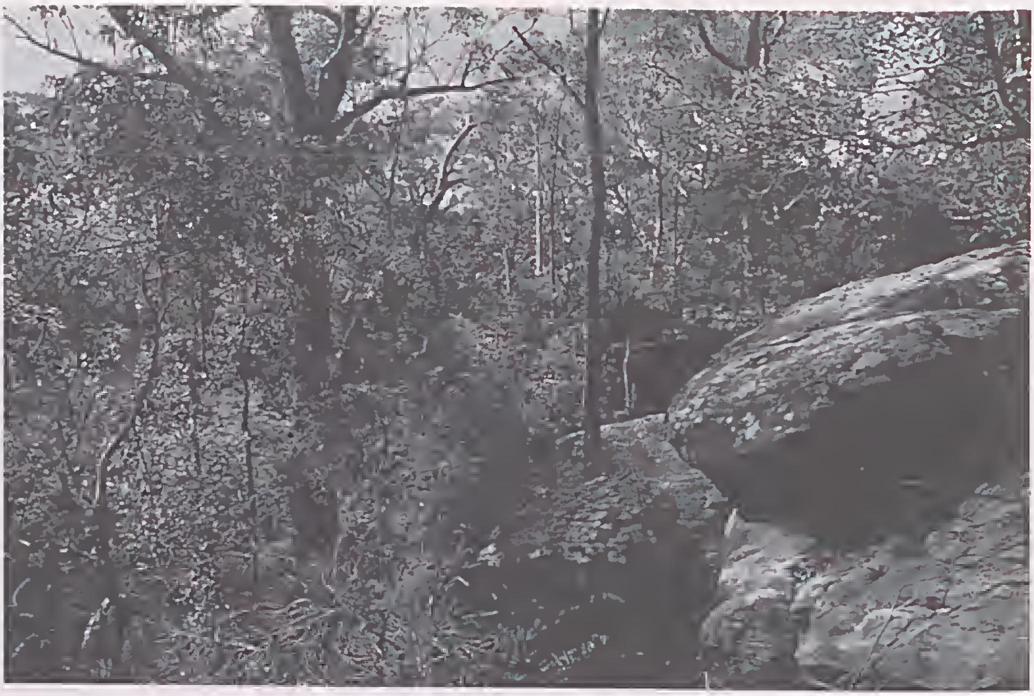


Figure 10. This open-forest in Pennant Hills Park, map unit 10ag(i), is typical of the vegetation on sheltered sandstone slopes in many of Sydney's bushland reserves.

of scrub, as well as sedge and shrub swamp. In terms of the floristic survey of Ku-ring-gai Chase by Outhred et al. (1985), Map Unit 10ag includes many of the M (particularly M4–M7), MT, and R series, while map unit 10ar covers the S, L and M (M1–M3) series.

Map unit 10ag

Sydney Sandstone Gully Forest

Sydney Sandstone Gully Forest has a widespread geographic distribution. It is found on the Hawkesbury Sandstone topography of the coast, Hornsby Plateau, lower Blue Mountains and Woronora Plateau. Map unit 10ag, open-forest to woodland, is generally confined to gullies and sheltered hillsides, particularly on southern to eastern aspects. Soils are shallow lithosols and siliceous sands, yellow earths and yellow podzolics (Hawkesbury Soil Landscape of Chapman & Murphy 1989), with deeper podzolic soils enriched by downwash material on lower slopes and in narrow valleys. Average height of the trees is 25 m, though varying from 18–30 m. Three sub-units are recognised.

i) Open-forest/woodland: *Eucalyptus piperita–Angophora costata–Eucalyptus pilularis*

The main trees are *Eucalyptus piperita*, *Angophora costata* and *Eucalyptus gummifera*. *Allocasuarina littoralis* is a common smaller tree. The understorey is dominated by a variety of shrubs, 0.5–2 m high, the main families being Proteaceae, Fabaceae and Myrtaceae. Pidgeon (1938) and Thomas and Benson (1985a) both list the following as frequent species: *Persoonia pinifolia*, *Acacia terminalis*, *Pultenaea daphnoides* and *Dodonaea triquetra*. There is considerable local variation in this community. For example localised occurrences of podzols on the Hornsby Plateau (Buchanan & Humphreys 1980), are characterised by the inclusion of a particular group of species, *Ceratopetalum gummiferum*, *Xylomelum pyriforme*, *Xanthorrhoea arborea*, *Ricinocarpos pinifolius* and *Gompholobium latifolium*.

Woodland of the more exposed parts of hillsides grades into open-forest as conditions become more sheltered, forming the vegetation characteristic of extensive tracts of sheltered sandstone slopes and gullies.

ii) Tall open-forest: *Eucalyptus pilularis–Syncarpia glomulifera*

Tall open-forest with trees over 30 m tall is found on the lower slopes of sandstone gullies in the Berowra Creek area, and on lower slopes where there is a localised enrichment from downwashed shale soils such as in the Lane Cove Valley. The main trees are *Eucalyptus pilularis* and *Syncarpia glomulifera* but also occurring are trees of *Eucalyptus piperita* and *Angophora costata* generally associated with adjacent open-forest. Allocasuarina torulosa is a common smaller tree in the understorey

iii) Closed-forest: *Ceratopetalum apetalum–Tristaniopsis laurina*

This is the distinctive riparian flora occurring in narrow bands along perennial creeks. It may be locally of closed-forest structure, but is most commonly scrub, spaced out amongst boulders of the sandstone banks. It is generally an understorey to open-forest of *Eucalyptus piperita* or *Angophora costata*. Characteristic species are *Tristaniopsis laurina, Callicoma serratifolia, Lomatia myricoides, Leptospermum polygalifolium,* and *Austromyrtus tenuifolia*, with *Ceratopetalum apetalum* occurring in more favourable sites. The rare *Leptospermum deanei* is found only along Middle Harbour Creek and the upper Lane Cove River. In sheltered gullies that receive downwash from ridges with Wianamatta Shale there may be tall open-forest with *Eucalyptus saligna*, and occasional rainforest species such as *Schizomeria ovata*, with ferns in the understorey.

Vegetation on soils on small volcanic intrusions are included in this map unit. For example, open-forest with *Eucalyptus agglomerata* and *Angophora floribunda* at Campbells Crater, and open-forest with *Eucalyptus paniculata* and *Eucalyptus umbra* on a dyke at West Head, both within Ku-ring-gai Chase National Park. Such sites have characteristic understorey species related to the generally more clayey and higher nutrient status of the volcanic soils (Thomas & Benson 1985a; Sanders 1983).

Map unit 10ar
Sydney Sandstone Ridgetop Woodland

Sandstone Ridgetop Woodland is found on the more exposed ridges and plateau tops with shallower soils interrupted by outcrops of rock. Soils are shallow lithosols and earthy sands, yellow earths and yellow podzolics (Faulconbridge, Lucas Heights, Hawkesbury and Lambert Soil Landscapes of Chapman & Murphy 1989). There may be an average depth of 5–10 cm in some habitats but tree roots penetrate the deeper pockets of soil amongst the underlying rocks (Pidgeon 1938).

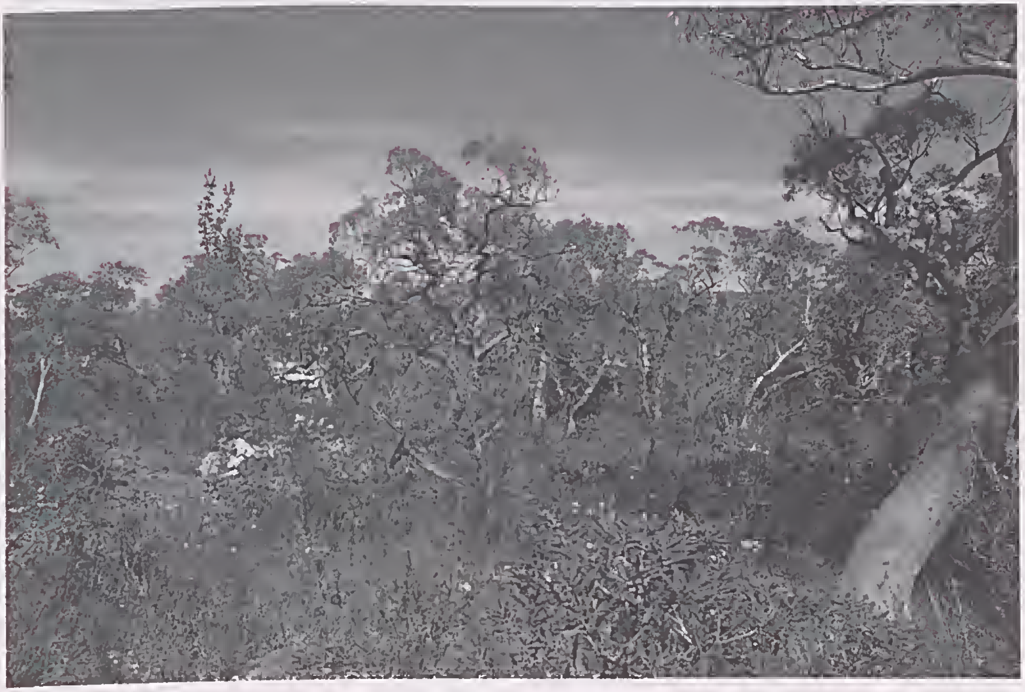


Figure 11. Low open woodland, map unit 10ar(ii), with *Angophora bakeri* and *Eucalyptus haemastoma* in Muogamarra Nature Reserve.

i) Woodland/Low woodland: *Eucalyptus gummifera–Eucalyptus haemastoma–Eucalyptus sparsifolia–Eucalyptus racemosa*

This is structurally very variable and includes areas of woodland, open-woodland, low woodland and low open-woodland, depending on local aspect, soil and drainage conditions, as well as the time since the last fire. Characteristic tree species are *Eucalyptus gummifera*, *Eucalyptus sparsifolia*, *Eucalyptus haemastoma* and *Eucalyptus racemosa*, sometimes with some intergradation between the latter two scribbly gum species. *Eucalyptus piperita* and *Angophora costata* may also occur. Localised patches of mallee eucalypts, *Eucalyptus luehmanniana*, *Eucalyptus obtusiflora*, *Eucalyptus camfieldii* and *Eucalyptus multicaulis*, may be responding to locally moister sites, or shallow rock platforms. *Eucalyptus capitellata* occurs on some more clayey ridges in the Terrey Hills area.

These dry, exposed communities have a rich sclerophyllous shrubby understorey, particularly with species of Proteaceae, Fabaceae, Epacridaceae and Myrtaceae. Common shrubs in Ku-ring-gai Chase National Park include species of *Pultenaea*, *Isopogon*, *Hibbertia*, *Hakea*, *Banksia*, *Boronia*, *Leucopogon*, *Grevillea*, *Gompholobium* and *Tetratheca*, as well as *Dillwynia retorta*, *Phyllota phylicoides*, *Leptospermum trinervium*, *Petrophile pulchella* and *Platysace linearifolia* (Thomas & Benson 1985a).

ii) Woodland/low woodland: *Eucalyptus eximia–Eucalyptus gummifera–Angophora bakeri*

This vegetation is found on dry hillsides and ridges in the north-west of the map sheet area, west of Berowra Creek, and is particularly widespread in Marramarra National Park. Rainfall is generally less than 1000 mm p.a., in contrast to the higher-rainfall (1000–1200 mm) country of Ku-ring-gai Chase and Brisbane Water National Parks. Characteristic trees include *Eucalyptus eximia* and *Angophora bakeri*, as well as the more widespread *Eucalyptus gummifera* and *Angophora costata*. Similar vegetation extends west to the lower Blue Mountains (Benson 1992a) and north into the MacDonald (Sanders et al. 1988) and Colo River areas.

iii) Open-scrub: *Banksia ericifolia–Hakea teretifolia*

In sites with shallow poorly-drained soil, patches of open-scrub with tall shrubs of *Banksia ericifolia* and *Hakea teretifolia* occur. Within the ridgetop woodland small patches of Coastal Sandstone Heath (Map Unit 21g) may occur, in particular coastal heath with *Banksia ericifolia* and *Darwinia fascicularis*, Open-heath with *Allocasuarina* and *Banksia ericifolia*, Rocky outcrop heath with *Baeckea diosmifolia* and *Baeckea brevifolia*, Wet heath with *Hakea teretifolia* and *Banksia oblongifolia*, and Open-scrub with *Angophora hispida*.

As mentioned earlier, floristic differences between gully forest and ridge woodland can be distinguished in Outhred's floristic analysis of Ku-ring-gai Chase vegetation, though there is considerable overlapping of species distributions. However, differences between the scrub or shrub-dominated vegetation and the taller woodland/forest vegetation are perhaps more marked. In particular, many species are essentially confined to the scrub vegetation or very open low tree vegetation, e.g. *Allocasuarina distyla*, *Phebalium squamulosum*, *Banksia oblongifolia*, *Kunzea capitata*, *Mirbelia rubiifolia*, *Stylidium lineare*, *Epacris microphylla*, and *Grevillea speciosa*. In contrast, very few species (e.g. *Micrantheum ericoides*), are essentially confined to the woodland, which is mainly made up of species that occur in both woodland and scrub, or woodland and forest. The woodland appears to be an ecotone between the heath and the forest.

Vegetation surveys of major Sydney sandstone areas include Brisbane Water National Park (Benson & Fallding 1981), Bouddi National Park (McRae 1990), Muogamarra Nature Reserve (Thomas & Benson 1985b), Ku-ring-gai Chase National Park (Thomas & Benson 1985a, Outhred et al. 1985, Rose 1982), Berowra Valley Bushland Park (Smith & Smith 1990), Pennant Hills Park (Beecroft–Cheltenham Civic Trust 1976), Lane Cove River State Recreation Area (Clarke & Benson 1987), Garigal National Park (McDougall & Conroy 1988–90, Sheringham & Sanders 1993) and Angophora Reserve and Hudson Park (Smith & Smith 1993). Brief reports and species lists are available for some of the islands of Broken Bay — Lion Island (Benson 1981, McDougall 1989), Spectacle Island (Webb 1981), Milson Island (Cleland 1914), Bar Island (Benson 1984) and Big Bay Island (Benson et al. 1989). Many of these lists have been included in Table 3.

Vegetation descriptions and/or species lists have been compiled for many other areas including the

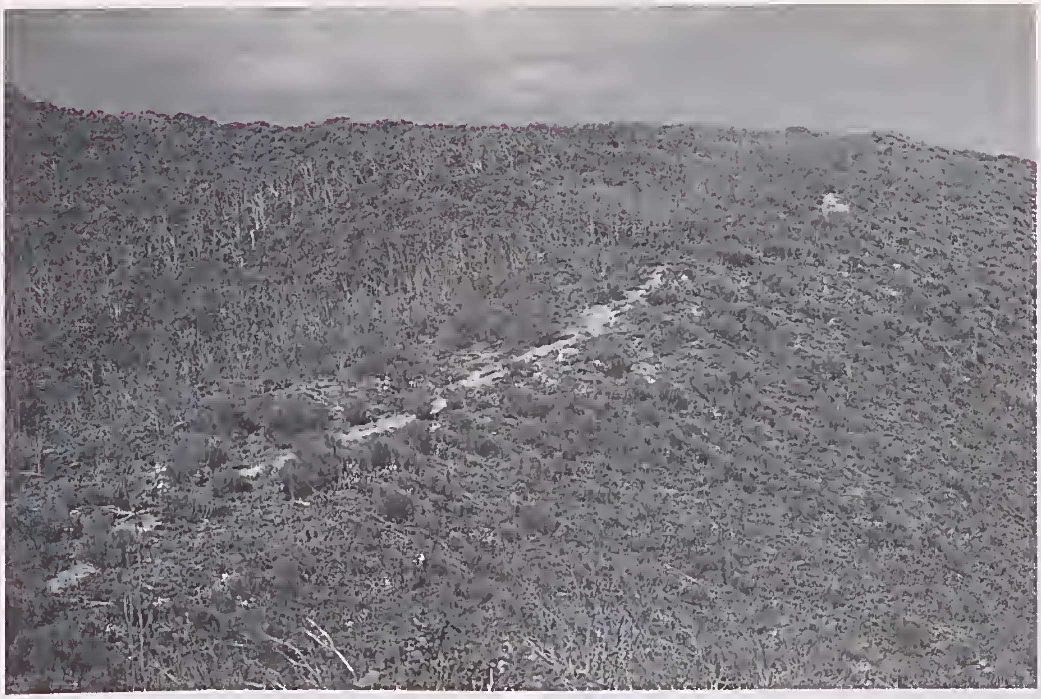


Figure 12. Coastal heath with *Allocasuarina distyla* at Bouddi National Park, map unit 21a(i), grades into woodland where there is shelter from onshore winds.

following ('V' indicates vegetation description included, 'F' indicates floristic list, 'M' indicates map): Elouera Bushland Reserve, Coveny (h) F, Benson (1980b) V; Katandra Sanctuary, Mona Vale, Coveny (l) F; Cheltenham, Coveny (b) F; Deep Creek, Narrabeen, McKern (1962) F, Coveny (f) F, Benson (1979a) V; Dee Why Lagoon, Coveny (g) F; Cumberland State Forest, Coveny (d) F; Lake Parramatta Reserve, Workers' Education Association Plant Ecology Group (1959) F, Coveny (m) F; Mowbray Park, Buchanan (1979a) VFM; Bantry Bay, Upper Middle Harbour Conservation Committee (1974) VFM; Manly Reservoir, Coveny (o) F; Vineyard Creek, Telopea, Benson (1980c) VF; Rawson Park, Mosman, Bradley & Bradley (1966–74) F, Benson (1975) VF; Garden Island, Rodd & Benson (1977) F; Outer Domain, Maiden (1902) also in Wilson (1985); Vaucluse, Holland (1980); Wolli Creek–Undercliffe–Bexley North, Benson (1978b) VF; Robinson (1986, 1987); Long Bay, Benson 1978a VF; Glebe Gully, Randwick, Coveny (j) F; La Perouse, Armstrong et al. (1976) VF.

Map unit 21a

Coastal Clay Heath

Coastal Clay Heath vegetation occurs on coastal headlands on shales and sandstones of the Narrabeen Group, mostly interbedded laminite and shale with quartz to lithic quartz sandstone. These are found along the coastline in Bouddi National Park (McRae 1990) and along the Warringah Peninsula between Long Reef and Barrenjoey. Further north Coastal Clay Heath is found at Norah Head and from Munmorah State Recreation Area to Catherine Hill Bay (Benson 1986a, Adam, Stricker et al. 1989). Vegetation here is low and scrubby, both because of the low nutrient status of its soils, and because it is exposed to winds from the ocean which restrict tree growth. Soils are variable, with lithosols, siliceous sands and yellow podzolics on the sandstone, and brown and red podzolics on the shale strata (Chapman & Murphy 1989). Heath vegetation occurs on the more sandy soils, while those with more clay tend to support grassy vegetation.

i) Open-heath: *Allocasuarina distyla*

Heath vegetation at Bouddi may range from open-heath to closed-heath 1.5m high and with up to 95% canopy cover depending on time since fire (McRae 1990). Similar vegetation occurs on Barrenjoey Head. The most characteristic canopy species is *Allocasuarina distyla*; other heath species include *Hakea teretifolia*, *Banksia ericifolia*, *Lasiopetalum ferrugineum* and *Platysace linearifolia*. The ground stratum is poorly developed, including *Lomandra longifolia*, or absent. Fire kills the *Allocasuarina*, which relies on seed for reestablishment, and for a number of years its seedlings cannot attain dominance over those of other species or over species relying on lignotubers for regrowth. During this phase the local species richness is increased and abundant species include *Hakea teretifolia, Banksia ericifolia, Isopogon anemonifolius, Isopogon anethifolius, Woollsia pungens, Actinotus helianthi, Cyathochaeta diandra* and *Themeda australis* (McRae 1990).

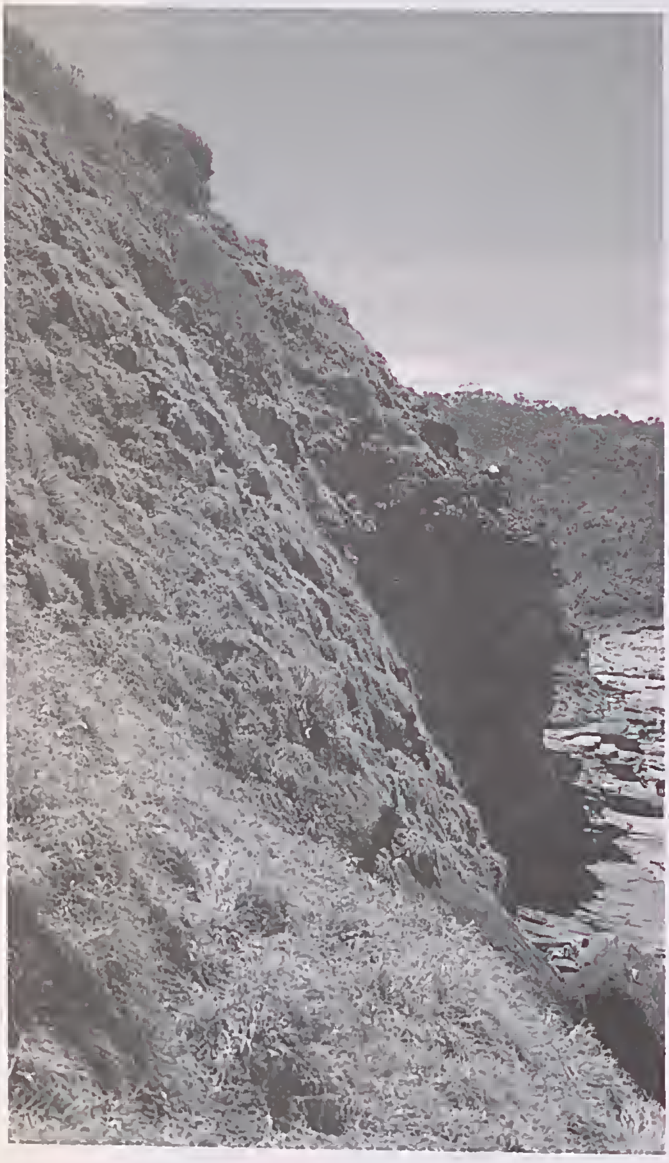


Figure 13. Grassland with *Themeda australis*, map unit 21a(ii), is characteristic of exposed coastal headlands of the Narrabeen Group shales and sandstone.

Allocasuarina distyla open-heath appears to be part of the *Banksia serrata–Allocasuarina distyla* community of Adam, Stricker et al.(1989) who comment that in overall diversity and species composition, stands on Hawkesbury Sandstone in the Sydney region and on Permian sandstone around Jervis Bay are very similar. It is also similar to their *Banksia ericifolia–Westringia fruticosa* community.

ii) Grassland: *Themeda australis*

Grassland dominated by *Themeda australis* occurs on exposed sites below coastal cliffs at Bouddi (McRae 1990) and on the Warringah Peninsula. It varies in height from 0.1 to 1 m with about 70% cover. *Themeda australis* is the main species, but there may also be a mixture of severely windswept shrubs such as *Westringia fruticosa, Banksia integrifolia* and *Baeckea imbricata*, smaller plants such as *Isolepis nodosus, Apium prostratum* and *Carpobrotus glaucescens* and the ferns, *Gleichenia rupestris* and the introduced *Cyrtomium falcatum*. *Themeda australis* grassland generally occurs on the most fertile headland soils possibly reflecting the long history of use and disturbance to which such sites have been subject (Adam, Stricker et al. 1989).

Map Unit 21b
Coastal Dune Heath

Coastal Dune Heath is found sporadically along the New South Wales coast. Major occurrences include Myall Lakes (Myerscough & Carolin 1986). On the Sydney map sheet Coastal Dune Heath is found on Mourawaring and Bombi Moors in Bouddi National Park (McRae 1990), at North Head, and in the Eastern Suburbs of Sydney. *Banksia aemula* open-heath is found on disjunct patches of highly leached, perched Pleistocene dune sand. The other community occurs on 'marine' sands of Holocene age. Coastal Dune Heath vegetation is often found associated with low woodland of *Angophora costata* and *Eucalyptus botryoides* on the sheltered slopes of steeper dunes (see Map unit 9t Coastal Dune Forest).

i. Open-heath: *Banksia aemula*

Banksia aemula open-heath is found on disjunct patches of highly leached, perched Pleistocene dune sand, on the Bombi and Mourawaring Moors in Bouddi National Park, on North Head and at La Perouse. Such sites are normally away from the immediate coastal environment and receive little salt-spray, but are on very low nutrient-status soils. This vegetation is discussed by Siddiqi et al. (1972) at Bouddi as dry *Banksia serratifolia* [=*aemula*] heath and by Adam, Stricker et al. (1989) as the *Banksia aemula–Hypolaena fastigiata* community.

At Bouddi, the shrub layer is up to 1.5 m high, with 20% canopy cover, and often merges with the low ground stratum, with 80% cover, dominated by graminoids (McRae 1990). The dominant shrub is *Banksia aemula* and common shrubs include *Allocasuarina distyla*, *Lambertia formosa*, *Platysace linearifolia*, *Isopogon anemonifolius*, *Persoonia lanceolata*, *Leptospermum polygalifolium* and low-growing *Eucalyptus umbra* and *Angophora costata*. Common understorey species include *Hypolaena fastigiata*, *Bossiaea ensata*, *Woollsia pungens* and *Lepidosperma* species. On the edges of the dunes a low open-woodland, 3 to 8 m high, dominated by *Angophora costata*, *Eucalyptus umbra* and *Allocasuarina distyla*, develops.

Pleistocene sand at North Head occupies the central part of the plateau but has been largely cleared of vegetation by the Army. A fringe of vegetation remains, some of which is in Sydney Harbour National Park. Most of this has been protected from fire for at least 30 years and now forms a dense scrub 8 m high dominated by the taller-growing *Leptospermum laevigatum* (Horton 1986). There are smaller shrubs of *Banksia aemula*, *Kunzea ambigua* and *Leptospermum*, many of which are now senescent or dying. Invasion of heathland by *Leptospermum laevigatum* in the absence of fire has been reported by Burrell (1981). An interesting aspect of the vegetation at North Head is the deterioration and death of individuals of the species *Eucalyptus camfieldii*, evidently in response to the lack of fire.

Small remnants of *Banksia aemula* open-heath, described as part of the Eastern Suburbs Banksia Scrub (Benson & Howell 1990a) occur at La Perouse, near Jennifer Street. This is the southern limit of distribution of *Banksia aemula* open-heath. Common shrub species here are *Banksia aemula*, *Monotoca elliptica*, *Eriostemon australasius*, *Ricinocarpos pinifolius* and *Xanthorrhoea resinosa*. There are many other species here and protection of the area is an important ongoing conservation issue. It has been burned frequently.

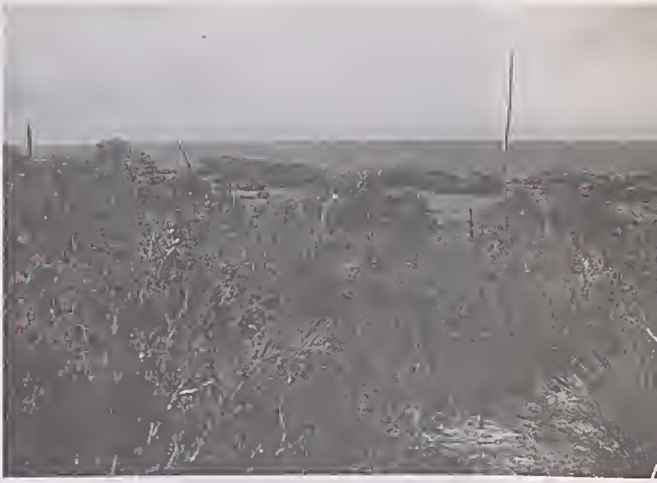


Figure 14. A small patch of the Eastern Suburbs Banksia Scrub, map unit 21b(i), survives at Jennifer St, La Perouse. The tall flowering spikes of *Xanthorrhoea resinosa* are conspicuous, particularly after fire.

ii. Open-scrub: *Monotoca elliptica–Banksia integrifolia–Leptospermum laevigatum*

This occurs on 'marine' sands of Holocene age and occasionally on in situ weathering of Hawkesbury Sandstone. Floristically not very diverse, *Monotoca elliptica* is the only constant (Adam, Stricker et al. 1989), but *Banksia integrifolia*, *Leptospermum laevigatum*, *Melaleuca armillaris*, *Pimelea linifolia* and *Acacia sophorae* are widespread. The shrub layer is frequently wind-pruned, but in sheltered locations *Monotoca elliptica* and *Leptospermum laevigatum* may be 3–4 m tall.

Map Unit 21g

Coastal Sandstone Heath

James Atkinson provided this excellent description of coastal heath in 1826. 'The barren scrubs almost every where border the sea coast, and extend to various distances inland; in some places two or three miles; in others, lands of a better description approach close to the water's edge. The soil in these scrubs is either sandstone rock or sterile sand or gravel, covered, however, with a

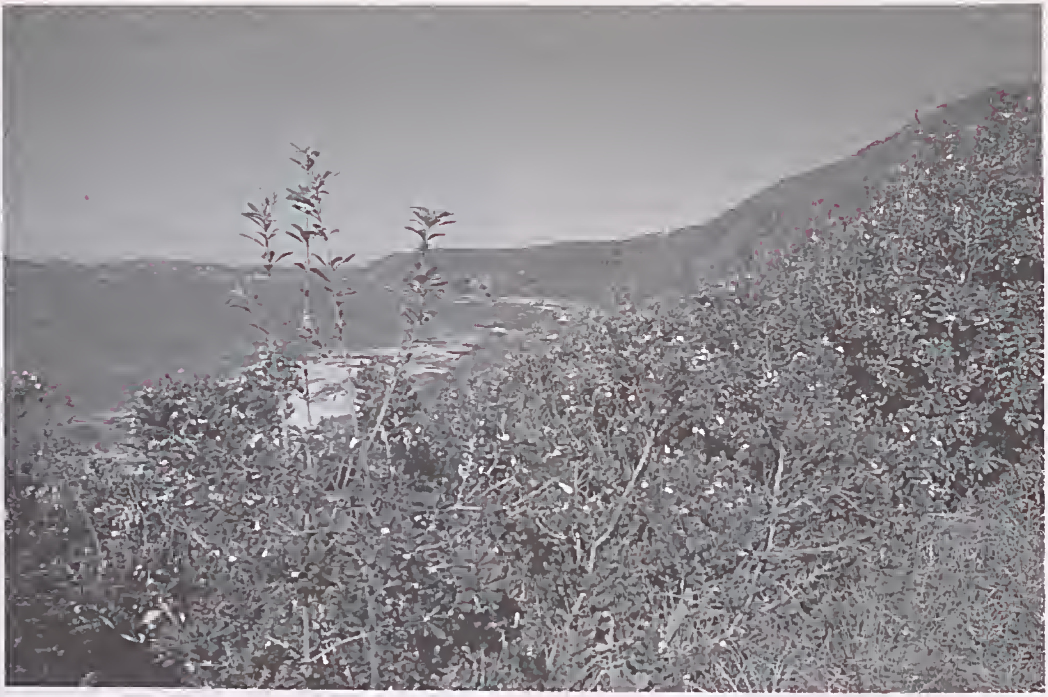


Figure 15. Coastal scrub with *Banksia integrifolia*, map unit 21b(ii), near Pearl Beach on the northern side of Broken Bay.

profusion of beautiful shrubs and bushes, producing the most elegant flowers, and affording a constant succession throughout the whole year, but most abundant in winter and spring; the shrubs and plants growing in these places furnish the Colonists with materials for brooms, but produce little else that can be converted to any useful purpose. – The grass tree, with its lofty flower stalk, is a conspicuous object in these wastes; of the hard and woody but light stalk of this plant the natives make the shaft of their spears, and shooting or fish gigs. Very few trees grow in these places, except a few stinted (sic) gum trees, in situations sheltered from the sea winds. Much honey might probably be collected from these scrubs, were bees plentiful in the Colony, and some small profit may possibly be thus made of them hereafter; but with this exception, they scarcely seem susceptible of any improvement'.

Coastal Sandstone Heath is found on Hawkesbury Sandstone headlands along the coast from Long Reef to La Perouse, and on nearby sandstone plateaus and ridges, particularly in the Deep Creek catchment and the Lambert Peninsula in Ku-ring-gai Chase National Park. Habitats include broad ridges, gently to moderately inclined slopes, wide rock benches with low broken scarps, small hanging valleys and areas of poor drainage. Soils are shallow, discontinuous earthy sands and yellow earths, siliceous sands, lithosols, leached sands, grey earths and gleyed podzolics (Lambert and Hawkesbury Soil Landscapes of Chapman & Murphy 1989).

Vegetation structure is variable, ranging through open-heath, shrubland, mallee, and sedgeland. Structure is influenced by fire frequency and the time since the last fire. Particularly important are the large, relatively quick-growing, but fire-sensitive (i.e. killed by fire) species (e.g. *Banksia ericifolia*, *Hakea teretifolia*, *Allocasuarina distyla*, *Petrophile pulchella*) that may readily predominate in a range of habitats under particular fire regimes. The interaction between these species and the generally slower-growing, more long-lived resprouter species (e.g. *Banksia oblongifolia*, *Angophora hispida*, *Lambertia formosa*) is an important consequence of the particular fire regimes in an area, with subsequent effects on vegetation structure and floristics. This is a potential area for future research. The other major factor in heath composition is soil moisture, and different communities are recognisable across the full range of drainage conditions.

Broad communities are recognised here, but there is considerable overlap and variation depending on the scale of the study. Small areas of this vegetation have also been mapped in unit 10ar.

i) Shoreline shrubland

Shrubland: *Baeckea imbricata*

On coastal sandstone headlands low shrubland of *Baeckea imbricata* frequently provides the most seaward zone of continuous vegetation. It is rarely more than 20 m wide, though *Baeckea* can be found as a component of communities considerably further inland (Adam, Stricker et al. 1989). The low-growing shrub, *Baeckea imbricata*, predominates in this community — *Westringia fruticosa* is frequent, but not abundant. High inputs of salt-spray are experienced and saltmarsh species occur — *Sporobolus virginicus, Samolus repens, Zoysia macrantha*. At more inland localities *Baeckea imbricata* dominates communities in wet hollows, where the community is a form of wet heath. Associated species include *Epacris obtusifolia, Callistemon citrinus* and *Sprengelia incarnata*. Good examples occur at North Head (Horton 1986), Long Bay and La Perouse. A detailed account of seacliff and headland vegetation is given in Adam, Stricker et al. (1989).

ii) Coastal heath

Open-heath/closed-scrub: *Banksia ericifolia–Darwinia fascicularis*

On the landward side of the *Baeckea* low shrubland, Adam, Stricker et al. (1989) describe a *Banksia ericifolia–Westringia fruticosa* community and then a more extensive (up to 1 km inland) *Banksia ericifolia–Darwinia fascicularis* closed-heath community. Frequent species include *Allocasuarina distyla, Hakea teretifolia, Melaleuca nodosa, Dillwynia floribunda, Lasiopetalum ferrugineum, Baeckea imbricata, Leucopogon microphyllus, Lepidosperma viscidum, Eriostemon buxifolius* and *Epacris microphyla*. Drainage is an important factor in determining the presence of particular species, Clemens and Franklin (1980) recognising differences in heath vegetation on North Head related to soil depth and drainage.

Banksia ericifolia–Darwinia fascicularis closed-heath occurs extensively at North Head (Clemens & Franklin 1980, Horton 1986), Long Bay and La Perouse, and is widespread on Hawkesbury Sandstone on the Central Coast of NSW as well as on soils from Permian Sandstone near Jervis Bay.

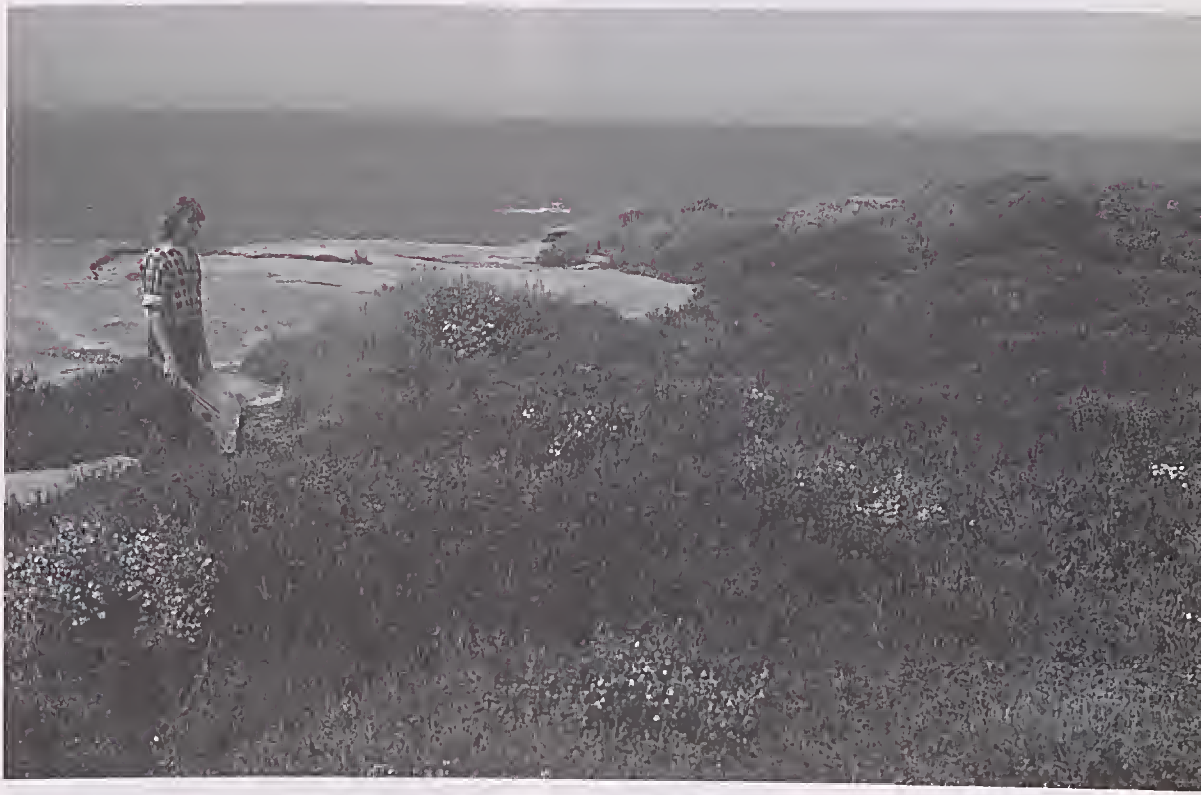


Figure 16. Coastal heath on sandstone rock platforms at Long Bay (map unit 21g(ii)).

iii) Open-heath/closed scrub: *Allocasuarina distyla–Banksia ericifolia*

This is similar to the previous community but occurs away from the immediate coastal influence and is widespread in Brisbane Water, Ku-ring-gai Chase and Garigal National Parks. It ranges from closed-scrub up to 4 m high to open-heath, with species such as *Banksia ericifolia*, *Allocasuarina distyla*, *Leptospermum trinervium*, *Phebalium squamulosum*, *Phyllota phylicoides*, *Angophora hispida* and *Pultenaea elliptica*.

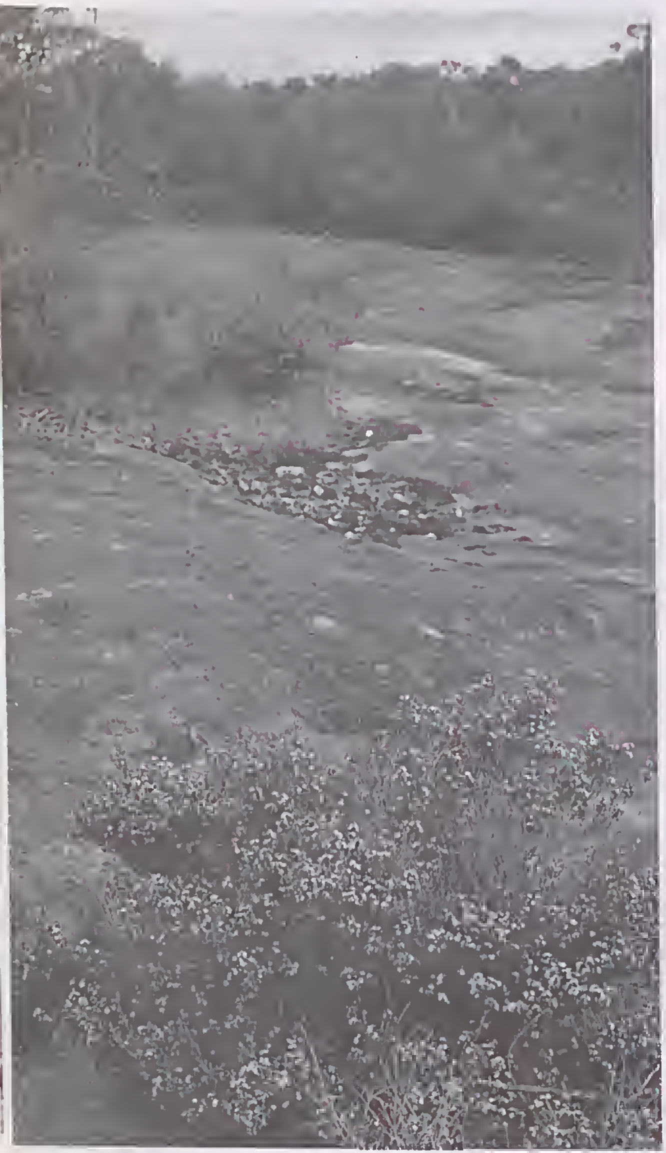


Figure 17. Extensive rocky outcrops with pockets of heath, map unit 21g(iv), occur in Brisbane Water National Park.

iv) Rocky outcrop heath

Open-heath: *Baeckea diosmifolia–Baeckea brevifolia*

Vegetation with a dense shrub cover to 1.5 m high among scattered, stunted emergent trees, occurs on broad, flat sandstone ridges with extensive rock outcrops, sometimes with occasional dense bonsai-like mats of *Baeckea* species (Sheringham & Sanders 1993). Shrubs include *Baeckea diosmifolia*, *Baeckea brevifolia*, *Allocasuarina distyla*, *Darwinia fascicularis*, *Kunzea capitata* and *Dillwynia sericea*. Such vegetation occurs commonly in Brisbane Water, Ku-ring-gai Chase and Garigal National Parks and in smaller parks in the Warringah area, for example at Bantry Bay (Upper Middle Harbour Conservation Committee 1974), and Manly-Warringah War Memorial Park (Benson 1981b).

v) Wet heath

Closed heath: *Hakea teretifolia–Banksia oblongifolia*

Closed-heath to 2 m high dominated by shrubs including *Banksia oblongifolia*, *Banksia ericifolia*, *Hakea teretifolia*, *Dillwynia floribunda*, *Epacris obtusifolia*, *Leptospermum squarrosum*, *Baeckea imbricata* and *Sprengelia incarnata* occurs on poorly-drained sandstone.

vi) Sedgeland/shrubland: *Banksia robur–Viminaria juncea–Gymnoschoenus sphaerocephalus*

Swamps form where drainage is permanently impeded. In the wettest areas these may be sedge swamps dominated by species of Cyperaceae and Restionaceae, or in drier sites, shrub swamps (Pidgeon 1938). Buchanan (1980) describes four distinct but intergrading swamp types for the Lambert Peninsula in Ku-ring-gai Chase National Park. Keith and Myerscough (1993) provide an excellent study of similar swamp vegetation on the Woronora Plateau.

vii) Open-scrub: *Angophora hispida*

Small patches of open-scrub with *Angophora hispida* occur in Marramarra National Park, either on ridges or associated with rock platforms. Characteristic species of these sites include *Calytrix tetragona*, *Dillwynia floribunda*, *Grevillea buxifolia*, *Petrophile pulchella* and *Platysace* *ericoides*. This vegetation probably represents a low-rainfall variant (annual rainfall about 800 mm) of the more coastal sandstone heaths (annual rainfall 1000–1200 mm). Heath is rare in low rainfall sandstone areas where it is replaced by woodland, indicating the importance of high moisture and poor drainage in preventing tree growth in heath areas.

viii) Shrubland (mallee): *Eucalyptus luehmanniana*

Small localised occurrences of *Eucalyptus luehmanniana* mallee shrubland or woodland occur in Garigal and Ku-ring-gai National Parks. These occur on sheltered upper to mid slopes on south-westerly to south-easterly aspects where drainage is poor and often associated with patches of wet heath (Sheringham & Sanders 1993).

Map Unit 27a

Coastal Swamp Forest Complex

i) Open-forest: *Eucalyptus botryoides–Eucalyptus robusta*

This occurs on poorly-drained sites in the Pittwater area, such as the Warriewood wetlands, but has been extensively disturbed, and very little remains.

ii) Open-forest: *Livistona australis*

Localised patches of *Livistona australis*, Cabbage Palm, occur in open-forest along the Warringah Peninsula from Palm Beach to Avalon, and along sections of Deep and Middle Creeks, particularly near Wakehurst Parkway. It also formerly occurred along the southern foreshores of Port Jackson in Sydney's eastern suburbs between Woolloomooloo and Rose Bay, but no naturally occurring palms are known to survive there now.

iii) Scrub: *Melaleuca linariifolia–Melaleuca styphelioides*

Paperbark swamp 5–18 m high with mid-dense to sparse cover of trees of *Melaleuca linariifolia* and *Melaleuca styphelioides*, small trees of *Callicoma serratifolia* and *Acacia longifolia* and sedges and ferns, *Gahnia clarkei*, *Gahnia sieberiana* and *Blechnum camfieldii* are found on floodplain alluvium along Deep Creek on better-drained areas surrounding herbland (Sheringham & Sanders 1993).

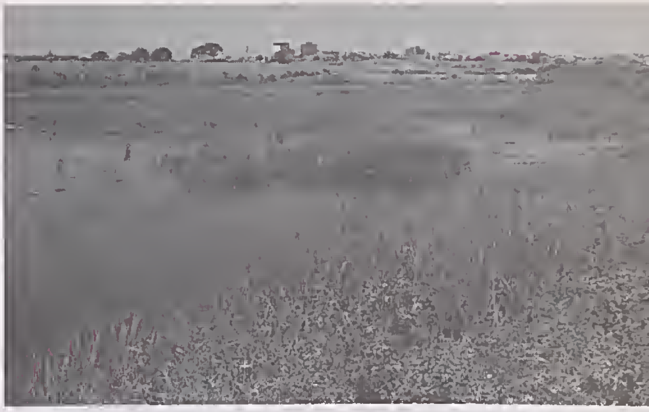


Figure 18. Remnants of the Botany Swamps at Eastlakes, map unit 28c(i) — sedgeland and open water provide important habitat for waterbirds and other wildlife.

iv) Reedland: *Phragmites australis–Typha orientalis*

Patches of reedland up to 3 m high, dominated by mainly *Phragmites australis* or *Typha orientalis*, grow on alluvial soils in estuaries and creeks in areas inundated with water for long periods and often brackish.

v) Herbland: *Persicaria strigosa–Blechnum camfieldii–Triglochin procera–Baumea juncea*

Waterlogged soil on alluvial floodplain of Deep and Middle Creeks has dense cover of herbs and sedges up to 2 m high. Ground species include *Persicaria strigosa*, *Blechnum camfieldii*, *Triglochin procera*, *Baumea juncea*, *Hypolepis muelleri*, *Viola hederacea*, *Isachne globosa* and *Villarsia exaltata*. Emergent shrubs include *Melaleuca styphelioides*, *Melaleuca linariifolia*, *Acacia longifolia* and *Leptospermum juniperinum* (Sheringham & Sanders 1993).

Map Unit 28c

Coastal Freshwater Swamp

This unit occurs in coastal freshwater swamp habitats, most of which have now been reclaimed, dammed or badly disturbed. They were particularly abundant on the sand deposits of the Eastern Suburbs (see Benson & Howell 1990a), with smaller swamps in the Woy Woy–Umina area. The main surviving examples are the Lachlan Swamp in Centennial Park and the Botany Swamps at Eastlakes and Botany.

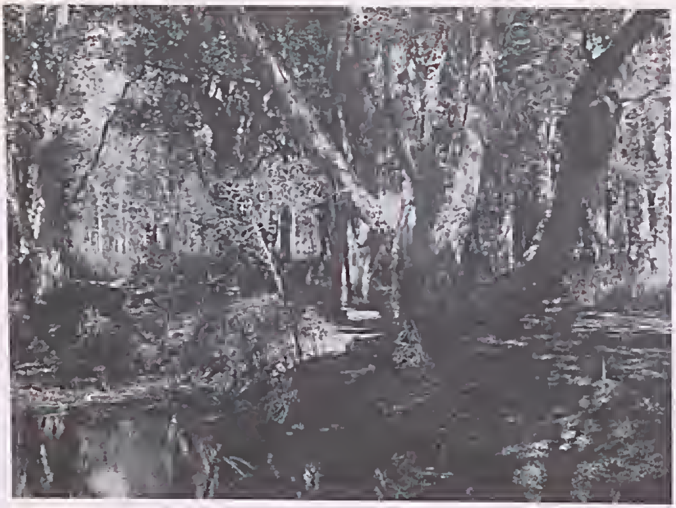


Figure 19. Old paperbarks, *Melaleuca quinquenervia*, with a ferny understorey in the Lachlan Swamp Reserve in Centennial Park (map unit 28c(ii)).

i) Open-sedgeland: *Eleocharis sphacelata–Baumea juncea–Persicaria decipiens*

Damming of the Botany Swamps last century provided one of Sydney's water supplies. Today there are lakes with open water and patches of tall emergent sedges, particularly *Eleocharis sphacelata*.

Areas of native vegetation are in the Millstream section of the Botany Swamps adjacent to Wentworth Avenue. Here, with patches of low woodland of *Melaleuca quinquenervia*, is sedgeland with Baumea articulata, *Baumea rubiginosa, Baumea juncea* and *Gahnia sieberiana*. There are also herbaceous species *Persicaria decipiens, Persicaria strigosa, Philydrum lanuginosum* and *Ludwigia peploides* subsp. *montevidensis*, and shrubs of *Leptospermum juniperinum, Callistemon citrinus* and *Viminaria juncea*. Unfortunately, as a result of disturbance, there is a considerable amount of exotic weed, in particular the shrub *Ludwigia peruviana*. The Water Board is taking steps to alleviate this problem and to rehabilitate the Wetlands.

ii) Low forest: *Melaleuca quinquenervia*

At the Lachlan Swamp Reserve in Centennial Park is a dense forest of *Melaleuca quinquenervia* with fern-banks of *Gleichenia dicarpa* and *Hypolepis muelleri*, and *Gahnia sieberiana*, still much the same as when described by Hamilton in 1919. 'These ferns [*Gleichenia dicarpa* and *Hypolepis muelleri*] may be observed engaged in such a competition in a peaty swamp in Centennial Park'. Extensive *Melaleuca* forest also occurred across the peaty flats behind Rose Bay (Hamilton 1919), whereas only a few individual trees survive today.

Major conservation areas

The rugged and inhospitable nature of the sandstone environments restrict development. As a result, many areas of natural vegetation remain, giving bushland surroundings to many Sydney suburbs. The importance of this urban bushland is now appreciated and a body of knowledge concerned with its management and protection is being developed by the various land management organisations together with input from research and teaching institutions and community groups.

A brief description of the vegetation of the major national parks and other conservation areas is given below. Plant species lists for most of these areas are compiled in Table 4, but it should be noted that the information available for different areas varies considerably. Many of the smaller urban bushland areas are described in Benson and Howell (1990a).

Angophora Reserve and Hudson Park

This is a reserve of about 18 ha at Avalon on Hawkesbury Sandstone capping and underlying Narrabeen Group (Newport Formation) interbedded shales and sandstones. Vegetation is *Angophora costata–Eucalyptus gummifera* woodland (about 8 ha), with a small area of fern swamp, *Gleichenia dicarpa* and sedge swamp, with *Lepyrodia scariosa* and *Epacris microphylla* on the Hawkesbury Sandstone; *Eucalyptus maculata* open-forest (about 8 ha) and a small area (about 0.5 ha) of *Livistona australis* palm stands on the Narrabeen Group soils (Smith & Smith 1993). A total of 293 vascular plant species have been recorded (227 native and 66 exotic), and the reserve includes the only known site around Sydney for the rare *Arthrochilus prolixus* (Smith & Smith 1993).

Barrenjoey Head

Barrenjoey Head at the southern entrance to Broken Bay is an isolated headland with a capping of Hawkesbury Sandstone overlying Narrabeen Group shales and sandstones. It is connected to the mainland by the thin strip of sand of Palm Beach. Woodland with *Eucalyptus botryoides* and *Banksia integrifolia* covers at least half of the headland extending from shore to ridgetop, particularly on the western half. Shrubs commonly found in the woodland understorey are *Pultenaea ferruginea* var. *deanei*, *Pultenaea daphnoides*, *Oxylobium ilicifolium* and *Jacksonia scoparia*.

Pockets of rainforest with *Acmena smithii* occur on shale soils in sheltered southerly aspects. Other species include *Backhousia myrtifolia*, *Syzigium oleosum*, *Pararchidendron pruinosum*, *Rhodomyrtus psidioides* (southern limit), *Diospyros australis*, *Guioa semiglauca*, *Cassine australis* var. *australis* and *Marsdenia rostrata*. *Tristaniopsis collina* is frequent in sheltered places and in the woodland, with occasional occurrences in heathland sheltered by large sandstone outcrops.

Allocasuarina distyla heathland occurs on clay soils on the upper parts of the headland and on the eastern end where it is more stunted. Common shrubs include *Hakea gibbosa*, *Acacia myrtifolia*, *Banksia ericifolia*, *Leptospermum trinervium*, *Lasiopetalum*

Figures 20 & 21. Conservation reserves have various forms of access that allow visitors to explore and experience the Sydney bush.

macrophyllum, *Isopogon anethifolius* and *Kunzea ambigua*. The small shrub *Mirbelia rubiifolia* and the sedge *Schoenus melanostachys* are very common in the lower stratum. *Leptospermum laevigatum* shrubland occurs on the lower southern slopes.

Berowra Valley Bushland Park

Berowra Valley Bushland Park (3880 ha in area) includes bushland along Berowra Creek and its tributaries from Pennant Hills to Berowra Waters. It was established as a reserve in its present form in 1987, but the southern part (640 ha south of Hornsby Rifle Range) has been a reserve, Elouera Bushland Natural Park, since 1964. The Park is administered by Hornsby Shire Council.

Smith and Smith (1990) carried out a detailed survey of the Park. They distinguished 17 plant communities; forest, woodland, heath and swamp communities associated with the dominant Hawkesbury Sandstone geology; taller eucalypt and low rainforest associated with more fertile soils; and eucalypt, *Casuarina*, mangrove and saltmarsh communities associated with the wider, tidal reaches of Berowra Creek. Several communities in the Park are poorly represented in other reserves. Especially important are taller forest communities characterised by *Eucalyptus saligna* and *Eucalyptus pilularis*.

Berowra Valley Bushland Park has a very rich flora, as is typical of vegetation on Hawkesbury Sandstone. A total of 517 native vascular plant species have been recorded. Ten of these species are on the national list of rare and threatened plants, including three species classified as vulnerable: *Eucalyptus camfieldii*, *Darwinia biflora* and *Tetratheca glandulosa*. Another four rare or threatened species have been recorded nearby and may also occur in the Park.

Bicentennial Park/Homebush Bay

Originally, Homebush Bay had the largest expanse of estuarine vegetation in Sydney Harbour, but this has been gradually reduced by extensive landfill projects beginning in the 1890s (Kachka 1993, Clarke & Benson 1988). Mangrove and some other wetland vegetation has been protected in Bicentennial Park, where boardwalks and an active environmental awareness program make these areas accessible. However, more important and undisturbed wetlands with extensive areas of saltmarsh, including populations of *Wilsonia backhousei*, *Halosarcia pergranulata* var. *pergranulata* and *Lampranthus tegens*, together with remnant Turpentine–Ironbark Forest (Map unit 9o) survive on military land at Silverwater. These areas are important because they have been protected from human disturbance — reports indicate a particularly high and abundant reptile fauna in the woodland — and should be maintained as limited access areas.

Botany Bay National Park (Cape Banks)

Vegetation at Cape Banks, Henry Head and La Perouse is part of Botany Bay National Park. Vegetation is mainly heath and open-forest on Hawkesbury sandstone,

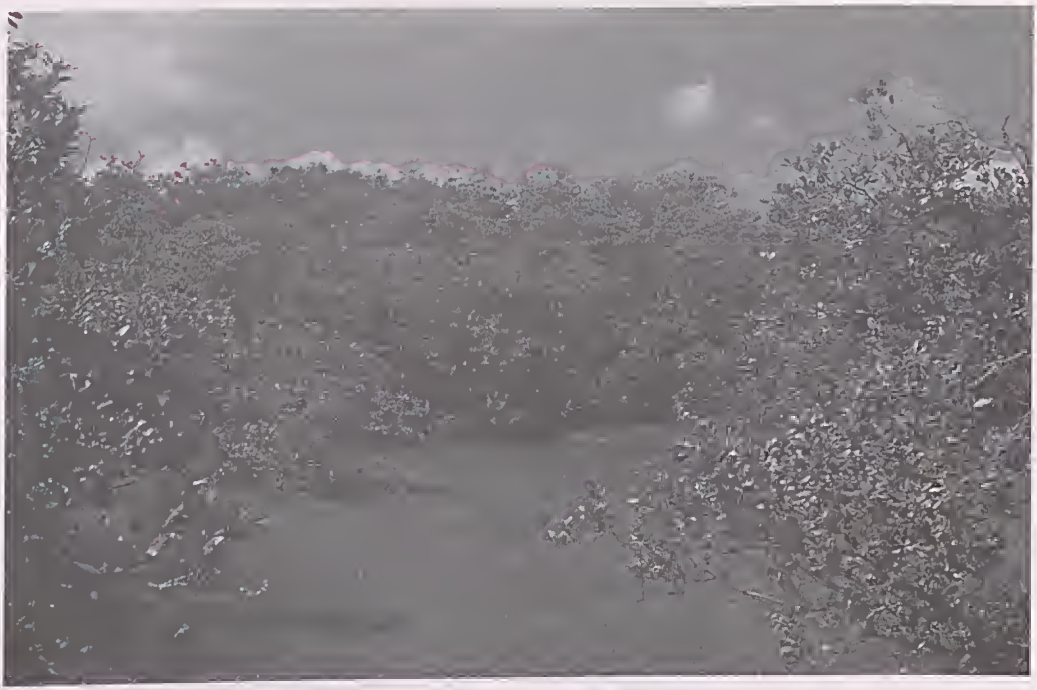


Figure 22. Mangroves, *Avicennia marina*, and saltmarsh, *Sarcocornia quinqueflora*, along Haslems Creek in Homebush Bay (map unit 4a). It is hoped that these will be retained during the development of the Olympic Games site.

and open-scrub of *Banksia integrifolia* on beach sand (Armstrong, Benson & Coveny 1976). The area is rich in native species, though the exotic weed, *Chrysanthemoides monilifera*, originally introduced to stabilise sand dunes, is a major problem in some areas. A small remnant of Pleistocene sand at Jennifer Street, La Perouse has *Banksia aemula* heath as well as important associated wetland vegetation, and has been recommended for conservation.

Bouddi National Park

Bouddi National Park is situated on the northern headland of Broken Bay, 45 km north of Sydney. Its vegetation has been described and mapped by McRae (1990), who described 15 plant communities related to habitat elements such as geology, geomorphology, climate and soil. The main components of the geology are Hawkesbury Sandstone and Narrabeen Series and the Park is important for the extensive areas of coastal vegetation on the latter. These include coastal grassland, heath and woodland and palm-dominated open-forest. A good account of the landscape, natural history and landuse is given in Strom (1986).

Brisbane Water National Park

The vegetation of Brisbane Water National Park has been described and mapped by Benson, J.S. and Fallding (1981). They described 15 plant communities; low open-forest, low open-woodland and open-woodland with dry or moist shrub understorey

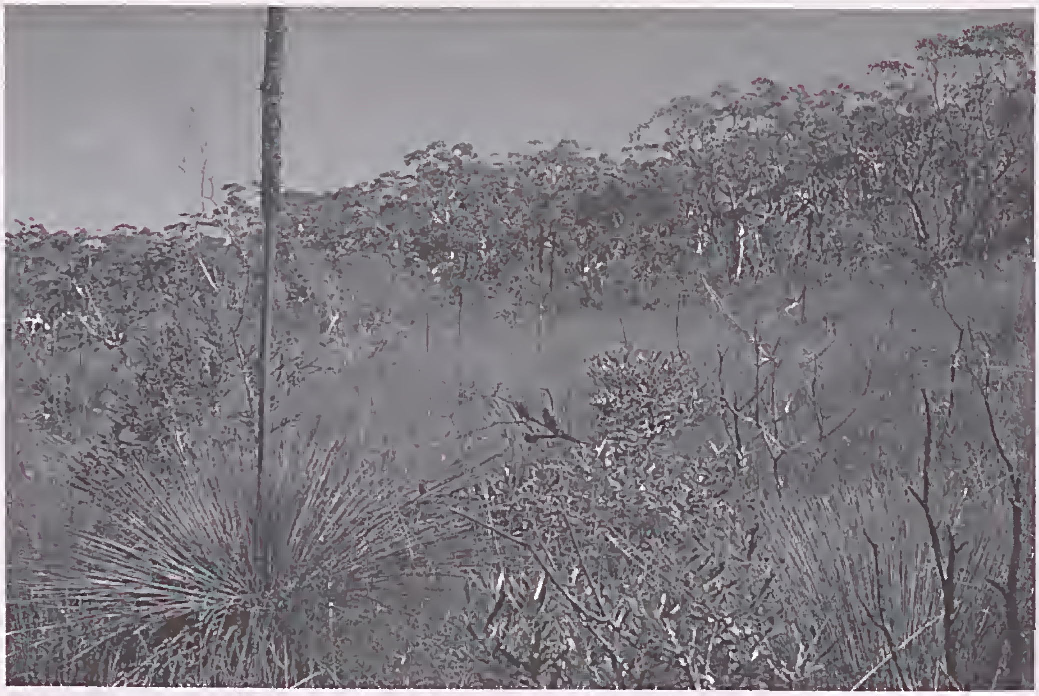


Figure 23. The effect of different drainage conditions can be seen here in Brisbane Water National Park — sedgeland on shallow poorly-drained soil in the foreground contrasts with woodland on better-drained soil.

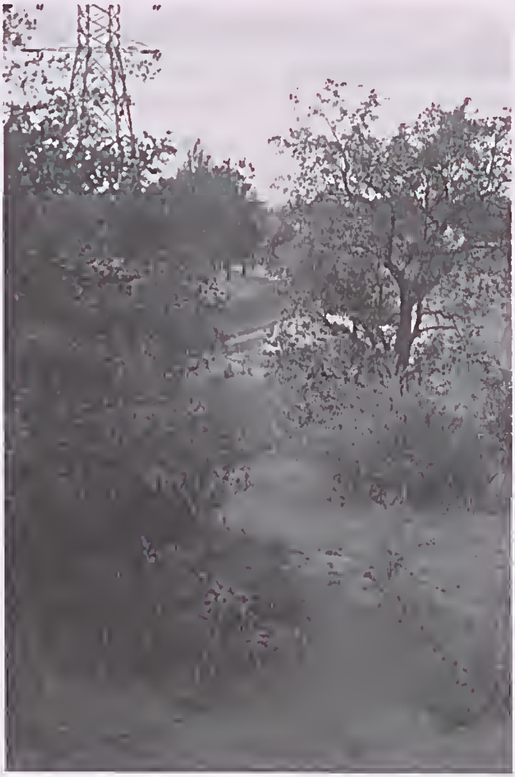


Figure 24. There is a small remnant of Turpentine Ironbark Forest on the clay soil above Cooks River at Campsie — a rare survivor of native vegetation along the River.

on the ridges and slopes of Hawkesbury Sandstone; open-forest on cooler aspects and on Narrabeen Group outcrops along the watercourses; sedgelands and open-scrub in higher, poorly-drained sites; coastal heath and rock outcrops with pockets of heath; closed-forest with rainforest species in valleys or along creeks, mainly on the Narrabeen group; and mangroves and rushland along tidal watercourses. A total of 657 native and exotic plant species were recorded. This includes ten considered to be rare or at risk.

Cooks River–Wolli Creek Valley

Though not primarily conserved as a nature reserve, remnants of native vegetation in Cooks River–Wolli Creek are the only remaining natural areas in inner south-western Sydney and need careful management. Cooks River includes very small localised patches of mangroves and reedland of *Phragmites australis*, and remnants of Turpentine–Ironbark Forest at Campsie (Benson 1992b) (see also Map unit 9o description). Vegetation at Wolli Creek includes eucalypt forest and heath on Hawkesbury Sandstone, freshwater marsh, saltmarsh and mangroves (Benson 1978b, Robinson 1986, 1987, Brown et al. 1988).

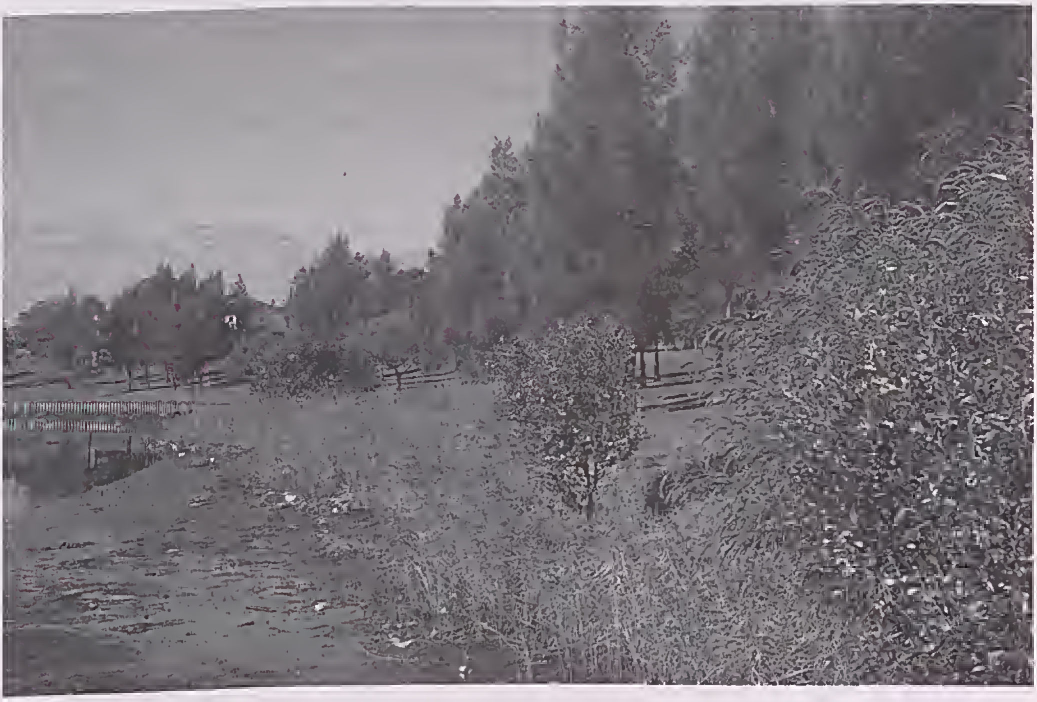


Figure 25. The Cooks River is mainly confined to a concrete or iron-lined channel, but here at Canterbury native reeds *Phragmites australis* grow on the bank. The rehabilitation of other bank sections using native species and the development of semi-natural vegetation with adjacent tree and shrub planting will provide much-needed wildlife habitat along the River and improve its appearance.

Figure 26. Creeks in sandstone gullies such as this in Garigal National Park provide sheltered and pleasant conditions. *Tristaniopsis laurina* is a frequent streamside species.

Cumberland and Darling Mills State Forests

These two forest areas together with the adjoining IBM Forest, demonstrate the influence of soil and geological changes on vegetation. Cumberland State Forest (40 ha) at West Pennant Hills has Wianamatta Shale soils with remnants of Blue Gum High Forest (Map unit 6b). Tree species include *Eucalyptus saligna, Eucalyptus paniculata, Eucalyptus tereticornis, Eucalyptus acmenoides* and *Angophora floribunda*. Darling Mills State Forest (50 ha) at North Rocks, 2 km further south and adjacent to Excelsior Park is dominated by massive outcrops of Hawkesbury Sandstone forming significant cliff faces, rock ledges and overhangs with a succession of sandstone terraces and escarpments. Vegetation here includes dry woodland of *Angophora bakeri* and *Eucalyptus gummifera* with shrubs of *Acacia linifolia, Leptospermum polygalifolium, Banksia serrata* and *Hakea sericea* as well as heath. Moist forest with *Eucalyptus pilularis–Eucalyptus saligna* and *Eucalyptus pilularis–Angophora costata–Eucalyptus piperita* is restricted to alluvial flats and sheltered hillsides. Details of these areas are given in the Forestry Management Plan (Forestry Commission of NSW 1984).

Dalrymple–Hay Nature Reserve

The need to conserve some remnants of such an impressive plant community as the Blue Gum High Forest (Map unit 6b) was recognised as far back as the 1930s when most of the forest had already been destroyed for farming or suburbs. At that time the NSW Forestry Commission planned to subdivide part of their Dalrymple–Hay State Forest at St Ives, but as a result of local action this Forest was preserved and later transferred to the National Parks and Wildlife Service as the Dalrymple–Hay

Nature Reserve. This Reserve has an area of 11 ha of *Eucalyptus pilularis, Eucalyptus paniculata, Angophora costata* and *Syncarpia glomulifera* trees with a shrub understorey on higher ground, and *Eucalyptus saligna* with a fern understorey along the main watercourse (Benson & Keith 1984a).

Garigal National Park — Narrabeen Lagoon catchment

The vegetation of Garigal National Park (Narrabeen Lagoon catchment) (approx. 820 ha) has been recently described and mapped by Sheringham and Sanders (1993) in an excellent report for the NSW National Parks and Wildlife Service. They describe and map 21 plant communities. These include extensive areas of heathland, woodland and open-forest on Hawkesbury Sandstone (Map units 10ar, 10ag, 21g) as well as much more limited and restricted areas of forest on remnant shale sites (9sf) and freshwater and estuarine reedland herbfield, paperbark swamp and swamp forest (27a).

Sheringham and Sanders (1993) found that differences in the major geological types, alluvial–sedimentary, were the main environmental influence on vegetation distribution, but that differences between shale and sandstone were less important. For vegetation on alluvial areas the depth, period of inundation and salinity of water are the major factors influencing species composition. The types with the highest conservation significance were the freshwater wetlands and swamps along the Deep Creek floodplain, and shale and lateritic forests restricted to the ridge along Forest Way and Mona Vale Road. Many of the wetlands are outside the Park boundary and have been recommended for addition to the Park as a matter of priority.

A list of over 600 species (both native and exotic) has been compiled for the National Park (Narrabeen Lagoon catchment) and surrounding Crown lands including species of national significance — *Grevillea caleyi, Tetratheca glandulosa, Eucalyptus luehmanniana, Lomandra brevis, Lomandra fluviatilis, Platysace stephensonii, Darwinia procera, Persoonia hirsuta, Genoplesium baueri, Hibbertia nitida* and *Angophora crassifolia* (Sheringham & Sanders 1993).

Garigal National Park — Middle Harbour Creek catchment

The vegetation types represented within the Middle Harbour Creek part of Garigal National Park (former Davidson State Recreation Area) include forest, woodland, heathland, scrubland, mangrove and saltmarsh, and vegetation of creek banks containing mesic species. Vegetation of particular importance includes areas of Coastal Sandstone Heath (map unit 21g), now scarce in Sydney due to urban spread. Examples may be seen on ridgetop areas of the Park — along the Cook St trail, parallel to Wakehurst Parkway above Bantry Bay, at the end of Matthews St, Davidson, and along part of the Stone Parade track to the Cascades. There is a significant stand of the rare mallee *Eucalyptus luehmanniana* in woodland on a south aspect slope beneath The Bluff.

There are also small remnants of ridgetop vegetation on the shale–sandstone transition, with soils rich in ironstone gravels. These remnants contain relatively uncommon species such as *Boronia rigens, Baeckea ramosissima* and *Leucopogon appressus*.

Vegetation along Bare Creek and upper Middle Harbour Creek includes the nationally significant species *Lomandra fluviatilis* and what is probably the largest known population of *Leptospermum deanei*. Further down Middle Harbour Creek are *Hibbertia nitida* and *Darwinia procera*. In upper-level creek sites, with more exposure to sunlight, are relatively uncommon plants with specific habitat requirements such as *Symphionema paludosum* and *Sprengelia incarnata*.

Gullies contain locally uncommon plant species such as *Cymbidium suave, Leucopogon lanceolatus* and *Boronia thujona* on the slopes. *Dracophyllum secundum, Rimacola elliptica* and *Epacris crassifolia* are found in crevices of rocky overhangs. Closer to the creeks are *Stenocarpus salignus, Lomatia myricoides, Drosera binata, Leucopogon amplexicaulis, Lycopodium deuterodensum, Blechnum ambiguum, Austromyrtus tenuifolia,* and *Hymenophyllum cupressiforme*. The very restricted shrub *Haloragodendron lucasii* occurs on an upper slope near Barra Brui.

Mangrove and saltmarsh are found in Bantry Bay and in Middle Harbour Creek and along tributaries from Roseville Bridge, upstream.

Georges River National Park

Hawkesbury Sandstone outcrops along the foreshores of the Georges River below East Hills. Downstream from here the river has the typical 'drowned valley' appearance characteristic of Sydney Harbour and Broken Bay. Georges River National Park includes foreshores downstream from Salt Pan Creek. Natural vegetation here is mostly woodland of *Angophora costata, Eucalyptus gummifera* and *Eucalyptus punctata*. On drier slopes are *Angophora bakeri* and *Allocasuarina littoralis*, while small patches of heath with *Angophora hispida* are found on some of the gravelly ridge-tops (Benson & Howell 1990a). Salt Pan Creek has areas of mangroves and saltmarsh.

Katandra Bushland Sanctuary

Katandra Bushland Sanctuary is a small reserve (11.5 ha) at Ingleside managed by a Department of Conservation and Land Management trust. Geology is Hawkesbury Sandstone with minor shale lenses, the aspect is easterly and the vegetation is mostly open-forest with closed-forest along the major creek lines. Main tree species include *Angophora costata, Eucalyptus gummifera, Eucalyptus piperita, Eucalyptus punctata* and *Eucalyptus umbra* (Map unit 10ag). The vegetation is generally moist and sheltered and includes species that are generally uncommon in Sydney including *Eucalyptus scias*, a tall tree in this habitat, the rainforest trees *Cryptocarya glaucescens, Cryptocarya microneura* and *Endiandra sieberi*, the shrubs *Bertya brownei, Boronia mollis, Boronia thujona, Prostanthera denticulata, Eupomatia laurina, Wilkiea huegeliana, Maytenus silvestris, Oxylobium ilicifolium, Correa reflexa*, and a vine *Passiflora cinnabarina*. *Cetatopetalum apetalum* is common along the creek lines with *Tristaniopsis laurina, Livistona australis*, the tree fern *Cyathea australis* and the cycad *Macrozamia communis*. The uncommon, primitive fern *Tmesipteris truncata* grows on trunks of *Todea barbara*, while *Psilotum nudum* is often found in rock crevices, and *Hymenophyllum cupressiforme* and *Grammitis billardieri* are found on damp rock surfaces. There are a large number of orchids including several species of *Acianthus, Pterostylis* and *Cryptostylis*, also *Gastrodia* *sesamoides, Chiloglottis reflexa, Corybas aconitiflorus, Dendrobium speciossisima* and *Dendrobium linguiforme* on rocks, *Lyperanthus suaveolens* on damp rocks and *Cymbidium suave* in trees.

On the upper slope are sandstone woodland species including *Banksia ericifolia* and *Banksia serrata, Xanthorrhoea media, Xanthorrhoea arborea, Phebalium dentatum* and *Acacia oxycedrus*. With *Gahnia clarkei*, three species of *Gleichenia* form dense thickets in a hanging swamp.

Ku-ring-gai Chase National Park

Ku-ring-gai Chase National Park (14 709 ha) is one of the major national parks of the predominantly sandstone Hornsby Plateau north of Sydney.

The nature and distribution of the vegetation is strongly related to geology, soil, drainage and aspect. Thomas and Benson (1985a) recognised 21 plant communities. There is considerable variation within some communities and intergradation between communities is a common feature. A floristic analysis of the vegetation has been carried out by Outhred et al. (1985).

As a conservation area, Ku-ring-gai Chase National Park is particularly important for its large area of relatively undisturbed vegetation of the type that gives Sydney bushland its distinctive character. It is also important for conserving vegetation types that are significant in a regional and local context. These tend to be of limited size and are associated with unusual or remnant geological and topographical

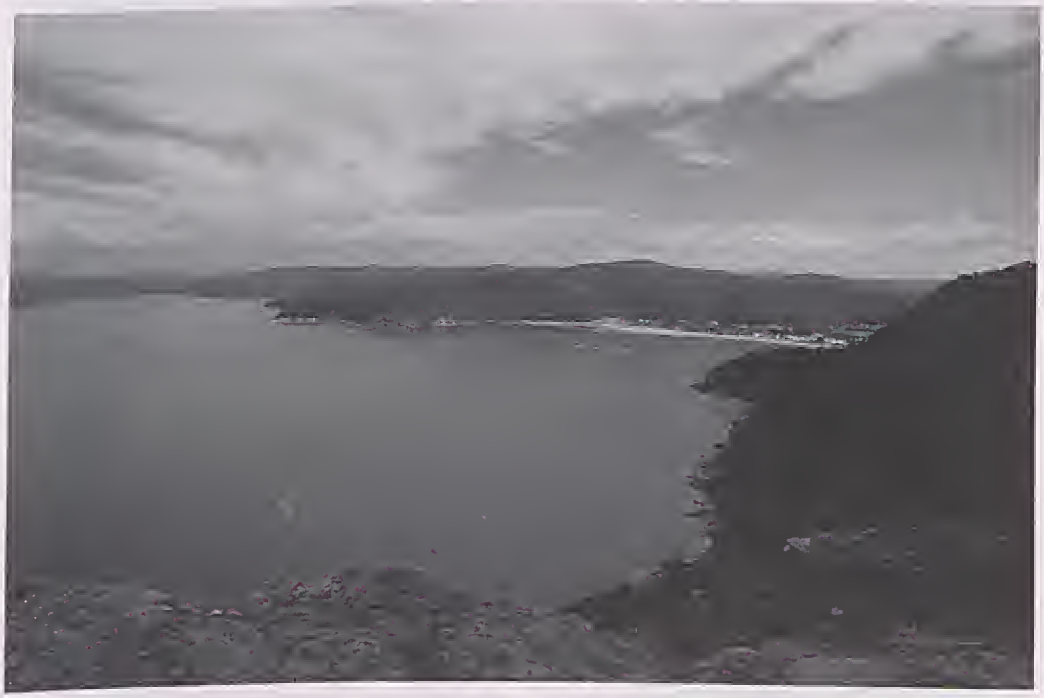


Figure 27. Extensive areas of sandstone country with woodland, heath and forest make up Ku-ring-gai Chase and Brisbane Water National Parks — here looking from Warrah Lookout towards Patonga Beach.

features e.g. Duffys Forest vegetation (map unit 9sf) and *Eucalyptus maculata–Eucalyptus paniculata* open-forest (part of map unit 9g).

A total of 566 native species from 119 families were recorded by Thomas and Benson (1985a), though Rose (1982) recorded 975 species, both native and exotic, over a longer period. Significant species recorded in Ku-ring-gai Chase include *Lomandra brevis, Genoplesium baueri, Leucopogon amplexicaulis, Austromyrtus tenuifolia, Darwinia biflora, Darwinia procera, Eucalyptus luehmanniana, Eucalyptus squamosa, Grevillea caleyi, Boronia fraseri, Rulingia hermannifolia, Tetratheca glandulosa, Cryptostylis hunterana, Eucalyptus camfieldii, Blechnum ambiguum* and *Kunzea rupestris* (Thomas & Benson 1985a).

Fire is an important factor affecting vegetation in many Sydney bushland areas. Many species have adaptive mechanisms that enable them to survive individual fires, but frequent fires with only short periods between them may lead to possible long-term changes to vegetation with some species being lost; fire-free periods of at least 10 years are desirable for much of the vegetation to allow replenishment of plant seedbanks etc. (Thomas & Benson 1985a, Benson 1985).

As for other 'urban' national parks, weed invasion in Ku-ring-gai Chase is a serious problem, and is associated with run-off from urban development, areas of past habitation within the Park, tracks, watercourses, border areas, specific areas of high public usage and some small areas of undisturbed bushland.

The map showing the vegetation of Ku-ring-gai Chase National Park and the adjacent Muogamarra Nature Reserve prepared by Thomas and Benson (1985a) has been reproduced without change at a reduced scale (1:40 000 scale, 2 cm = 1 km), on the back of the Sydney 1:100 000 Vegetation Map Sheet. It shows more detail than the 1:100 000 sheet, for example map unit 10ar is divided into five units. Relationships between the two maps are given in Table 3.

Table 3. Plant communities in Ku-ring-gai Chase National Park and Muogamarra Nature Reserve

Summarised descriptions give map code, structure, habitat, geology and dominant species based on Thomas and Benson, 1985, *Vegetation survey of Ku-ring-gai Chase National Park* (Royal Botanic Gardens Sydney). Code in brackets at end shows relevant map unit for Sydney 1:100 000 map sheet.

1 **Closed-forest**

Tristaniopsis laurina, Ceratopetalum apetalum

Gully Rainforest in sheltered gullies close to sea level, Hawkesbury Sandstone soils **(10ag)**.

2 **Low closed-forest/Closed-forest with emergent trees**

Acmena smithii, Glochidion ferdinandi, Livistona australis, emergents —*Eucalyptus botryoides, Angophora floribunda*

Rainforest with emergent eucalypts. Sheltered slopes, mostly western Pittwater, Narrabeen Group soils **(9h)**.

3 **Tall open-forest/Open-forest**

Eucalyptus agglomerata, Angophora floribunda, Allocasuarina torulosa

Confined to breccia in Campbells Crater **(6c)**.

4 **Open-forest**

Eucalyptus paniculata, Eucalyptus umbra, Eucalyptus scias, Syncarpia glomulifera, Angophora floribunda

Clay soils from weathered volcanic dyke at West Head **(6c)**.

5 **Open-forest**

Eucalyptus maculata, Eucalyptus paniculata, Syncarpia glomulifera, Allocasuarina torulosa

Western Pittwater, on Narrabeen Group shales **(9g)**.

6 **Open-forest**

Angophora floribunda, Eucalyptus paniculata, Eucalyptus botryoides, Eucalyptus scias, Syncarpia glomulifera, Allocasuarina torulosa

Sheltered slopes, Western Pittwater, Narrabeen Group shales and sandstones **(9h)**.

7 **Open-forest**

Angophora floribunda, Eucalyptus punctata, Allocasuarina torulosa

Footslopes above saltwater estuaries and foreshores of Cowan Creek, Coal and Candle Creek, Smiths Creek and Hawkesbury River. Mostly Narrabeen Group **(9h)**.

8 **Open-forest**

Eucalyptus pilularis, Eucalyptus resinifera, Angophora costata, Syncarpia glomulifera

Upper Cockle Creek valley on Wianamatta Shale soils **(9o)**.

9 **Open-forest**

Eucalyptus piperita, Angophora costata, Eucalyptus gummifera, Eucalyptus umbra, Syncarpia glomulifera

Sheltered aspects on slopes, particularly steep south-facing slopes, Hawkesbury Sandstone soils including podsols **(10ag)**.

10A **Open-forest**

Eucalyptus capitellata, Eucalyptus gummifera, Eucalyptus sieberi, Eucalyptus haemastoma

Along Mona Vale Road on 'lateritic' soils from shale lenses now exposed as cappings on plateaus over Hawkesbury Sandstone **(9sf)**.

10B **Open-forest/Low open-forest**

Eucalyptus sieberi, Eucalyptus gummifera, Eucalyptus sparsifolia, Eucalyptus haemastoma

At Duffys Forest on 'lateritic' soils from shale lenses now exposed as cappings on plateaus over Hawkesbury Sandstone **(9sf)**.

11 **Low open-forest**

Eucalyptus racemosa, Eucalyptus gummifera, Eucalyptus sparsifolia, Eucalyptus sieberi

On flat ridgetops e.g. Windybanks Ridge, on Hawkesbury Sandstone with yellow-earth soils, clay sub-soils and ironstone fragments **(10ar)**.

12 **Low open-forest with patches of Grassland**

Allocasuarina torulosa, Allocasuarina littoralis, Banksia integrifolia, emergent trees: *Angophora costata, Eucalyptus botryoides*

Exposed sites on headlands with clay soils from the Narrabeen Group **(21a)**.

13 **Woodland**

Angophora costata, Eucalyptus gummifera, Eucalyptus umbra, Allocasuarina littoralis and (west of Cowan Creek) *Eucalyptus eximia*

Moderate to steep slopes, exposed aspects on Hawkesbury Sandstone **(10ar)**.

14 **Low woodland**

Eucalyptus camfieldii, Eucalyptus haemastoma, Eucalyptus gummifera

Clay soil with ironstone fragments on Hawkesbury Sandstone. Very restricted, West Head Road/ Elvina Bay Track **(10ar)**.

15 Low woodland/Low open-woodland

Eucalyptus gummifera, Eucalyptus haemastoma, Eucalyptus sparsifolia, Eucalyptus eximia (west of Cowan Creek), *Angophora bakeri* (in Muogamarra Nature Reserve). Low slope plateau areas: crests, spurs and upper slopes on Hawkesbury Sandstone **(10ar)**.

16 Low open-woodland (mallee)

Eucalyptus luehmanniana

Seepage zones on upper slopes with southerly aspects on Hawkesbury Sandstone. Uncommon **(10ar)**.

17 Closed scrub/Scrub-heath

Banksia ericifolia, Hakea teretifolia, Allocasuarina distyla, Leptospermum trinervium, Angophora hispida, emergents — *Eucalyptus haemastoma, Eucalyptus gummifera*

Poorly-drained areas on the plateaus, low slope areas on ridges, hillsides and sandstone benches and thin skeletal soils on ridgetops. Hawkesbury Sandstone **(21g)**.

18 Pockets of Heath on rocky outcrops

Baeckea brevifolia, Baeckea diosmifolia, Kunzea capitata, Calytrix tetragona, Darwinia fascicularis subsp. *fasicularis, Allocasuarina distyla*

Exposed rock platforms with shallow depressions, Hawkesbury Sandstone **(21g)**.

19 Tall open-scrub

Avicennia marina, Aegicerus corniculatum

Mangroves along tidal watercourses and mud flats. Mainly limited to Upper Cowan Creek, Smiths Creek, Cockle Creek and Porto Bay, Kimmerakong Bay, Joe Crafts Bay and Peats Bight **(4a)**.

20 Reedland/Rushland and *Casuarina* Woodland

Juncus kraussii, Phragmites australis, Sarcocornia quinqueflora, Baumea juncea, Sporobolus virginicus, Casuarina glauca

Alluvial flats associated with tidal creeks, on landward side of Mangroves (Community 19) **(4a)**.

21 Sedgeland/Shrubland

Gahnia sieberiana, Empodisma minus, Leptocarpus tenax, Schoenus brevifolius, Gymnoschoenus sphaerocephalus, Xyris operculata, shrubs — *Banksia robur, Sprengelia incarnata, Viminaria juncea, Callistemon citrinus*

Areas of impeded drainage with a consistently high watertable, Hawkesbury Sandstone **(21g)**.

Lane Cove River National Park

The Lane Cove River has incised a narrow valley through Ashfield Shale and Hawkesbury Sandstone. Since the rise in sea level about 6 000 years ago, the river and its tributaries have deposited alluvium in the lower river and estuary. Microclimatic variations resulting from differences in solar radiation due to aspect, slope and horizon factors have a major role in influencing vegetation patterns within various landscape types.

Lane Cove River National Park (formerly State Recreation Area) (400 ha in area) occupies a 10 km strip along the Lane Cove River from Browns Waterhole to Fullers Bridge. Surrounded by suburbs, it is probably one of the most intensively used bushland parks in Sydney.

Historical changes affecting fire regimes and vegetation patterns in the Lane Cove valley, particularly since the arrival of Europeans, have been studied by McLoughlin (1985) and Clark and McLoughlin (1986). The present vegetation of the National Park has been described by Clarke and Benson (1987), who recognise 15 plant communities and record the occurrence of approximately 360 native species. Species of significance include *Darwinia biflora, Leptospermum deanei, Eucalyptus squamosa, Austromyrtus tenuifolia, Epacris crassifolia, Boronia polygalifolia* and *Leucopogon amplexicaulis.*

The lower valley is characterised by wide alluvial flats that are often intertidal and saline. Vegetation types include mangrove, saltmarsh and rushland. Although the alluvial deposits along the river have always been high in nutrient status they have probably been significantly enriched by run-off and siltation from urbanisation. Alluvial deposits become extensive in the middle section of the river where minor floodplains occur. Vegetation types include tall forest of *Eucalyptus pilularis–Eucalyptus saligna* (Map unit 6b) and *Eucalyptus pilularis–Eucalyptus piperita–Syncarpia glomulifera* (Map unit 10ag). Flooding of the Lane Cove River is a major factor influencing the alluvial vegetation, with minor floods depositing fine silt and weeds onto river flats.

Lower slopes and hills below Ashfield Shale have Hawkesbury Sandstone as their parent material and consist mainly, though not exclusively, of coarse sandstone. Minor shale and laminite lenses occur. These produce benches and breaks in the boulder-strewn landscape. Nutrient deficient lithosols are the main soil type on Hawkesbury Sandstone, although deeper yellow podzolic soils and red podzolic soils may develop on shale lenses. Open-forest of *Angophora costata–Eucalyptus piperita–Eucalyptus gummifera*, closed shrubland of *Banksia ericifolia–Leptospermum trinervium–Angophora hispida*, riparian shrubland of *Tristaniopsis laurina–Callicoma serratifolia–Lomatia myricoides* and woodland of *Eucalyptus racemosa–Eucalyptus gummifera–Allocasuarina littoralis* (Map unit 10ar) occur on these Hawkesbury Sandstone soils. The nutrient levels in some of these soils have been increased by urban run-off (Clements 1983).

Wianamatta Group Ashfield Shale (laminite and dark grey siltone) occurs on upper ridges, forming an undulating landscape with gentle slopes. Soils vary between brown and red podzolics on upper slopes to red and yellow podzolics on lower slopes and valleys. Open-forest of *Eucalyptus resinifera–Syncarpia glomulifera* (Map unit 9o) occurred here but has been mostly cleared. Numerous shale fragments near the surface of these soils are often a feature where they overlie Hawkesbury Sandstone.

As an area of natural vegetation containing this variety of habitats and plant communities within the suburban context, Lane Cove provides environmental experiences and education for a significant local and regional population. The range of landscapes in Lane Cove River National Park differ from those in the national parks of the upper Hornsby plateau and the Woronora Plateau; in particular the alluvial valley soils have more clay influence from the Wianamatta Shale of the surrounding ridgetops. With the added influence of the higher rainfall at this location, these valleys support types of tall forest now rare in the metropolitan area.

Lion Island Nature Reserve

Lion Island (8 ha), situated at the entrance to Broken Bay, is similar geologically to the nearby Brisbane Water National Park, with a Hawkesbury Sandstone capping on the eastern end and strata of the underlying Narrabeen Group exposed else-

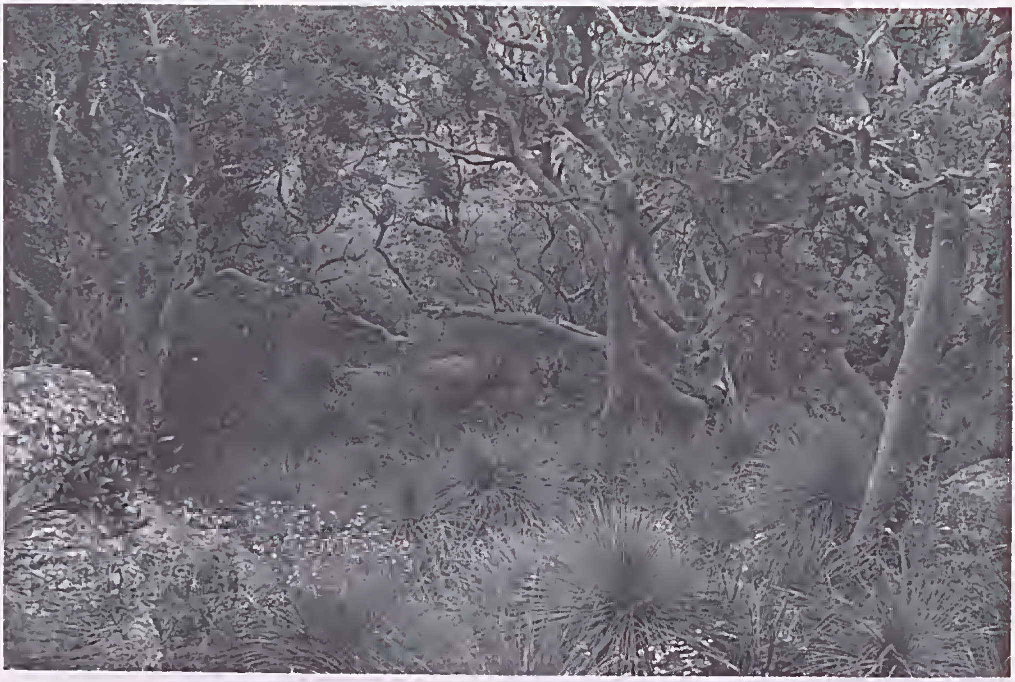


Figure 28. Woodland with the twisted limbs of *Angophora costata* and understorey of *Xanthorrhoea arborea* on Lion Island in Broken Bay.

where. The main vegetation on the eastern end is low woodland of *Angophora costata* and *Eucalyptus botryoides*, with shrubs of *Banksia serrata*, *Exocarpos cupressiformis*, *Xanthorrhoea arborea*, *Platysace lanceolata*, *Hakea sericea*, *Dodonaea triquetra* and *Acacia ulicifolia* (Benson 1981a).

At the western end of the island is low open-forest of *Banksia integrifolia* and *Allocasuarina littoralis*. On more exposed sites this grades into scrub with *Leptospermum laevigatum* and *Banksia integrifolia*. The exotic *Lantana camara* is common in these situations.

On scree slopes at the eastern end of the island and exposed to the ocean is herbland with *Commelina cyanea*, *Lobelia alata* and *Dichondra repens*. Shrubs of *Westringia fruticosa* are found in cracks between large sandstone boulders and higher up in cracks and ledges on the cliff faces. Benson (1981a) gives a species list for the island.

Long Island Nature Reserve

Long Island Nature Reserve (73 ha), adjacent to Brooklyn, is a long narrow east-west oriented ridge and has similar vegetation to other Hawkesbury Sandstone islands such as Spectacle Island, although it has very little plateau vegetation.

Manly–Warringah War Memorial Park

Manly-Warringah War Memorial Park (480 ha), managed by Warringah Shire Council, is mostly catchment of Manly Reservoir and is surrounded by the suburbs of Frenchs

Forest, Allambie Heights, North Manly and Balgowlah; Wakehurst Golf Course and Garigal National Park. The geology is Hawkesbury Sandstone with some shale lenses. Much of the vegetation is woodland of *Eucalyptus gummifera* and *Eucalyptus haemastoma; Angophora crassifolia*, a small tree or mallee found only in the eastern parts of the Hornsby Plateau, is in low woodland near Frenchs Forest and there are small patches of *Eucalyptus obstans* in heath near Allambie Heights. On shallow soil on the ridges is heathland (Map unit 21g); shrubs are *Leptospermum trinervium, Darwinia fascicularis, Kunzea ambigua, Angophora hispida*, with *Actinotus helianthi, Blandfordia nobilis, Leucopogon* and *Epacris* species. *Allocasuarina distyla* and *Banksia ericifolia* are dominant in taller shrubland with *Banksia oblongifolia* and *Hakea teretifolia* in poorly-drained soil. In sheltered gullies is open-forest, mainly *Eucalyptus piperita* and *Angophora costata*. Shrub species in woodland/open-forest include *Dodonaea triquetra, Acacia terminalis, Persoonia pinifolia, Persoonia linearis, Pultenaea flexilis, Dillwynia retorta, Boronia pinnata, Crowea saligna, Eriostemon australasius, Ceratopetalum gummiferum*, and *Telopea speciosissima*. Some species restricted to creek lines are *Tristaniopsis laurina, Ceratopetalum apetalum, Callicoma serratifolia, Baeckea linifolia, Austromyrtus tenuifolia* and an uncommon sedge *Restio tetraphyllus* subsp. *meiostachys*. An uncommon orchid *Rimicola elliptica* was recorded on a moist rock ledge. Important wetland vegetation with *Eleocharis sphacelata, Juncus* species, *Baumea nuda, Philydrum lanuginosum, Persicaria decipiens, Schoenus melanostachys*, and *Schoenus brevifolius* provides habitat for birds at the northern end of the reservoir.

Marramarra National Park

Marramarra National Park is a major reserve (11 760 ha) northwest of Sydney, between the Hawkesbury River, Old Northern Road and Berowra Creek. It is mainly Hawkesbury Sandstone plateau country with some narrow cappings of Wianamatta Shale, mostly cleared, and several volcanic necks. The area is generally drier than Ku-ring-gai Chase National Park further east.

Mangroves, *Avicennia marina* and *Aegiceras corniculatum* grow in saline conditions on mudflats in bays and tidal stretches of creeks. These often have *Duboisia myoporoides* on the banks. Creek vegetation above the tidal limit, includes *Tristaniopsis laurina, Backhousia myrtifolia, Trochocarpa laurina, Leptospermum grandifolium* and occasionally *Leptospermum deanei*. The rare local endemic *Asterolasia elegans* is found on sheltered slopes near creeks, though *Asterolasia correifolia* is more common here. *Boronia fraseri, Boronia anemonifolia, Darwinia peduncularis, Prostanthera rhombea, Zieria involucrata*, and *Lasiopetalum macrophyllum* occur occasionally on creekbanks.

In gullies approaching Coba Bay, possibly with volcanic influence, there is tall open-forest of *Eucalyptus agglomerata*, with *Angophora floribunda* extending to the flats. *Platysace clelandii* is occasional on lower sheltered slopes here with *Allocasuarina torulosa*. In gullies, and on slopes with east to southerly aspects, is open-forest of *Eucalyptus piperita, Angophora costata* and *Allocasuarina littoralis* (map unit 10ag) with *Eucalyptus gummifera* and *Eucalyptus sparsifolia* in low open-forest on the edge of ridges (map unit 10ar).

Vegetation on dry ridges (and slopes with north to westerly aspect) is low-woodland to woodland of mainly *Eucalyptus eximia* and *Eucalyptus haemastoma*, often with *Eucalyptus punctata* and *Eucalyptus gummifera*. *Hakea bakeriana* occurs in small patches in woodland on ridges, *Doryanthes excelsa* also occurs north of Canoelands Ridge. There are occasional occurrences of *Eucalyptus squamosa* and patches of *Angophora bakeri*. On rocky parts, *Eucalyptus eximia* is interspersed with low shrubland, often with patches of *Grevillea linearifolia* (narrow-leaved form) and *Dillwynia sericea*. Common shrubs are *Zieria laevigata*, *Gompholobium grandiflorum*, *Leucopogon muticus* and less commonly *Eriostemon hispidulus*. A disjunct population of the south coast species, *Dampiera scottiana* occurs in *Eucalyptus haemastoma* woodland. Populations of *Kunzea rupestris* are rare on rock platforms and *Micromyrtus blakelyi* has been found in a similar habitat. There are some rocky ridgetops in the Park but only very limited areas of heath and sedgeswamp vegetation. Marramarra National Park is an important link between the coastal sandstone vegetation e.g. in Ku-ring-gai, and the more inland vegetation of the Blue Mountains and Wollemi regions.

Muogamarra Nature Reserve

Muogamarra Nature Reserve (2 234 ha) lies north of the suburbs of Cowan and Berowra Heights, and is bounded by Berowra Creek, the Hawkesbury River, the Pacific Highway and Main Northern Railway. To the east and west lie Ku-ring-gai Chase and Marramarra National Parks respectively, while north of the Hawkesbury is Brisbane Water National Park. Muogamarra forms an integral part of the landscape of northern Sydney and conserves a significant portion of the Sydney sandstone bushland.

The vegetation of Muogamarra has been described by Thomas and Benson (1985b) and mapped with the Ku-ring-gai map (see map on back of Sydney 1:100 000 sheet). The nature and distribution of the vegetation is strongly related to geology, soil, drainage and aspect. Within Muogamarra 11 plant communities were recognised including closed-forest, open-forest, low open-forest, woodland, low woodland/low open-woodland, closed scrub/scrub-heath, pockets of heath on rocky outcrops, tall open-scrub, reedland/rushland with woodland, and sedgeland/shrubland. There is considerable variation within some communities and intergradation between communities is a common feature.

Weed invasion is generally of minor significance, with the exception of the Peats Crater area, and is restricted to a few localised sites and some general occurrences along tracks.

Over 400 species from 95 families were recorded by Thomas and Benson (1985b). Significant species include *Lomandra brevis*, *Tetratheca glandulosa*, *Boronia fraseri*, *Micromyrtus blakelyi*, *Platysace clelandii*, *Austromyrtus tenuifolia*, *Eucalyptus squamosa* and *Blechnum ambiguum*.

Spectacle Island Nature Reserve

Spectacle Island Nature Reserve (36 ha) is a small island in the Hawkesbury River, near its junction with Mooney Mooney Creek. It is about 1 200 m long and 600 m wide, up to 120 m high, and capped with Hawkesbury Sandstone which overlies Narrabeen strata that outcrop along the lower slopes. Vegetation, described by Webb (1981), is similar to that of the nearby Brisbane Water and Ku-ring-gai Chase National Parks. On the flat sandstone top of the island is open-woodland with trees of *Eucalyptus gummifera* and *Angophora costata* with an open understorey of *Imperata cylindrica* and scattered shrubs of *Banksia marginata, Xylomelum pyriforme, Gompholobium latifolium* and *Kunzea ambigua* (map unit 10ar). This extends onto the steep, upper sandstone slopes. On the lower slopes, on soils from Narrabeen strata, trees of *Angophora floribunda* with a grassy understorey predominate on the north-facing slopes, *Eucalyptus punctata* on the relatively flat western end of the island, and denser vegetation with *Acacia elata, Allocasuarina torulosa* and *Allocasuarina littoralis* on the steep southern slopes. There are mesic gully species at the base of the sandstone cliffs on the southern side. This is all part of the Narrabeen Slopes Forest (map unit 9h).

Sydney Harbour National Park

Sydney Harbour National Park includes a number of significant areas of vegetation associated with the Harbour foreshores and islands. Substantial areas of North Head including the former Quarantine Station, Dobroyd Head, Middle Head, Bradleys Head and Ashton Park, parts of South Head and Nielsen Park, and Shark, Clark and Rodd Islands are included, though the original bushland on the islands has generally been cleared. Many of these areas were formerly military land and include a scattering of military relics within the bushland.

Remaining vegetation is almost all on Hawkesbury Sandstone, with the soils and degree of exposure to salt-laden sea spray together determining the structure and floristic composition. Exposed sites on shallow soils particularly on North Head and Dobroyd Head have Coastal Sandstone Heath (map unit 21g) which, because of the immediate coastal influence, includes shoreline species such as *Baeckea imbricata, Westringia fruticosa, Olearia tomentosa* and *Melaleuca hypericifolia* (see Adam, Stricker et al. 1989) as well as coastal heath of *Banksia ericifolia–Darwinia fascicularis*. In more sheltered sites open-forest and woodland with *Angophora costata, Eucalyptus botryoides, Eucalyptus gummifera* occur. A very restricted patch of Coastal Dune Heath (map unit 21b) with *Eucalyptus camfieldii* (Horton 1986) occurs on North Head.

Wallumatta Nature Reserve

Wallumatta Nature Reserve is a small reserve (about 5 ha) in East Ryde that retains an example of the Turpentine-Ironbark Forest of the Wianamatta Shale in areas of moderate rainfall (i.e. 900–1100 mm p.a.). In the metropolitan area only about 0.5% of this forest remains. Wallumatta includes over 90 plant species of the shale flora with a transition zone from shale to sandstone vegetation (Benson & Keith 1984c). The nearby Field of Mars Reserve includes good areas of sandstone but very little shale vegetation.

The National Parks and Wildlife Service, in association with the Ryde–Hunters Hill Flora and Fauna Preservation Society, has established a joint committee to oversee Wallumatta. Because it is a particularly important example of Sydney's remnant vegetation it will be used mainly for education, research and nature study.

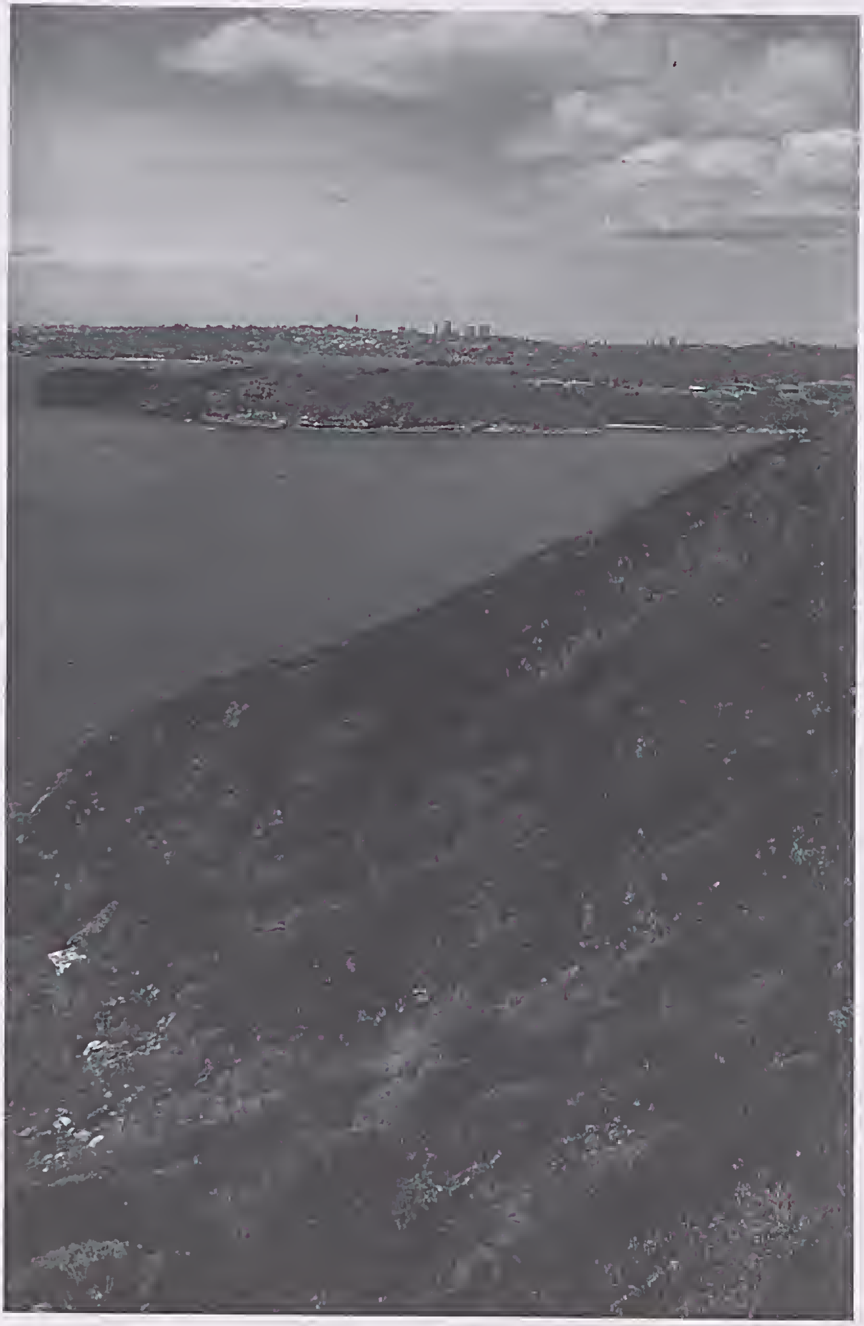
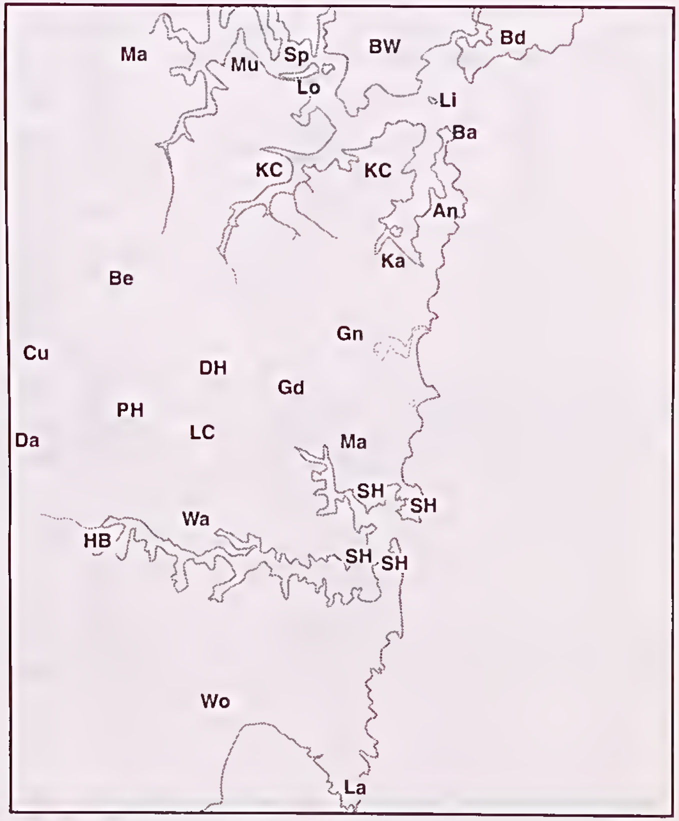


Figure 29. Heath and woodland at Dobroyd Head in Sydney Harbour National Park after an extensive fire in 1990. Periodic fire is an important factor in maintaining species composition in heathland.

Table 4. Native plant species recorded from major conservation areas in the Sydney map sheet area

Species are arranged alphabetically within families and major groups. List is based on various references (see below) with some additions by Doug Benson and Lyn McDougall. Areas are ordered north to south, with codes as follows.

Bd	Bouddi National Park (McRae 1990)
BW	Brisbane Water National Park (Benson & Fallding 1981)
Li	Lion Island Nature Reserve (Benson 1981a, McDougall 1989)
Sp	Spectacle Island Nature Reserve (Webb 1981)
Lo	Long Island Nature Reserve (Coveny & McDougall 1990)
Ma	Marramarra National Park (Benson et al. 1989, NPWS n.d., McDougall 1993)
Mu	Muogamarra Nature Reserve (Thomas & Benson 1985b)
Be	Berowra Valley Bushland Park (Smith & Smith 1990)
KC	Ku-ring-gai Chase National Park (Thomas & Benson 1985a)
Ba	Barrenjoey (McDougall 1994)
An	Angophora Reserve and Hudson Park (Smith & Smith 1993)
Ka	Katandra Bushland Sanctuary (Coveny, I.)
Gn	Garigal National Park: Deep Creek Catchment (Sheringham & Sanders 1993)
Gd	Garigal National Park: Davidson Park (McDougall & Conroy 1988–90)
Cu	Cumberland State Forest (Forestry Commission of NSW 1984)
PH	Pennant Hills Park (Beecroft Cheltenham Civic Trust 1976)
DH	Dalrymple Hay Nature Reserve (Benson & Keith 1984a)
Da	Darling Mills State Forest (FC of NSW 1984)
LC	Lane Cove National Park (Clarke & Benson 1987)
Ma	Manly Dam Memorial Park (Benson 1981)
Wa	Wallumatta Nature Reserve (Benson & Keith 1984c)
SH	Sydney Harbour National Park: includes North Head, Dobroyd Head, Bradleys Head, Nielsen Park (Holland 1980, NPWS n.d., Horton 1986)
HB	Homebush Bay (Kachka 1993)
Wo	Wolli Creek Valley (Robinson 1987)
La	La Perouse (Armstrong et al. 1976)



Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Ferns and fern allies																									
Adiantaceae																									
Adiantum aethiopicum	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH	Da	LC			SH		Wo	La
Adiantum formosum		BW							KC																
Adiantum hispidulum	Bd	BW					Mu	Be				Ka	Gn		Cu			Da	LC						
Adiantum silvaticum		BW							KC										LC						
Aspidiaceae																									
Polystichum australiense	Bd							Be																	
Aspleniaceae																									
Asplenium australasicum		BW							KC			Ka										SH		Wo	
Asplenium difforme			Li							Ba															La
Asplenium flabellifolium	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba		Ka	Gn	Gd				Da	LC			SH		Wo	
Blechnaceae																									
Blechnum ambiguum		BW				Mm	Mu	Be	KC			Ka	Gn									SH			
Blechnum camfieldii	Bd	BW										Ka	Gn												
Blechnum cartilagineum	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH	Da	LC			SH		Wo	La
Blechnum indicum													Gn												
Blechnum nudum		BW					Mu	Be						Gd					LC			SH			
Blechnum wattsii		BW																							
Doodia aspera	Bd	BW				Mm	Mu	Be	KC	Ba	An				Cu			Da	LC						
Doodia caudata		BW						Be	KC	Ba			Gn					Da				SH			
Cyatheaceae																									
Calochlaena dubia	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH	Da	LC	Ma	Wa	SH		Wo	La
Cyathea australis		BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd			DH			Ma				Wo	La
Davalliaceae																									
Arthropteris tenella									KC																
Davallia pyxidata	Bd	BW	Li		Lo	Mm	Mu	Be	KC			Ka	Gn							Ma		SH			
Dennstaedtiaceae																									
Dennstaedtia davallioides																			LC						
Histiopteris incisa		BW	Li			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			Da	LC	Ma		SH		Wo	La

Hypolepis muelleri		BW			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			LC	Ma		SH	Wo	La
Hypolepis punctata		BW																				
Pteridium esculentum	Bd	BW	Li	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	DH	Da	LC	Ma	Wa	SH	Wo	La
Dryopteridaceae																						
Lastreopsis decomposita	Bd	BW																				
Lastreopsis microsora		BW			Mm	Mu		KC														
Gleicheniaceae																						
Dicranopteris linearis					Mm	Mu																
Gleichenia dicarpa	Bd	BW		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd				LC	Ma		SH	Wo	La
Gleichenia microphylla		BW		Lo	Mm	Mu	Be	KC			Ka	Gn	Gd			Da				SH		
Gleichenia rupestris	Bd	BW			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd							SH		La
Sticherus flabellatus		BW		Lo	Mm	Mu	Be	KC			Ka	Gn				Da	LC			SH		
Grammitidaceae																						
Grammitis billardieri		BW					Be				Ka											
Hymenophyllaceae																						
Hymenophyllum cupressiforme		BW			Mm	Mu	Be	KC			Ka	Gn	Gd			Da	LC					
Lindsaeaceae																						
Lindsaea dimorpha		BW																Ma				
Lindsaea linearis	Bd	BW		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		Da	LC	Ma	Wa	SH		La
Lindsaea microphylla		BW		Lo	Mm	Mu	Be	KC	Ba		Ka	Gn	Gd	Cu	DH	Da	LC			SH		
Lycopodiaceae																						
Lycopodium cernuum		BW																				
Lycopodium deuterodensum		BW				Mu		KC					Gd									
Lycopodium laterale		BW			Mm	Mu	Be						Gd				LC					
Osmundaceae																						
Todea barbara	Bd	BW		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd			Da		Ma		SH	Wo	
Polypodiaceae																						
Dictmia brownii		BW					Be															
Microsorium scandens		BW																				
Platycerium bifurcatum	Bd	BW		Lo	Mm		Be		Ba		Ka			Cu						SH		
Pyrrosia rupestris		BW		Lo	Mm	Mu	Be	KC			Ka	Gn	Gd	Cu			LC			SH		

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Psilotaceae																									
Psilotum nudum		BW	Li				Mu	Be	KC	Ba	An	Ka	Gn	Gd					LC	Ma				Wo	
Tmesipteris truncata		BW										Ka	Gn												
Pteris tremula								Be				Ka			Cu										
Pteris umbrosa									KC																
Schizaeaceae																									
Schizaea bifida							Mu	Be	KC			Ka	Gn	Gd				Da	LC			SH			
Schizaea dichotoma		BW					Mu	Be					Gn	Gd											
Schizaea rupestris		BW				Mm	Mu					Ka	Gn	Gd											
Selaginellaceae																									
Selaginella uliginosa	Bd	BW									An	Ka	Gn	Gd						Ma		SH			La
Sinopteridaceae																									
Cheilanthes distans		BW			Lo		Mu	Be				Ka						Da							
Cheilanthes sieberi	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba			Gn	Gd					LC		Wa	SH	HB		
Pellaea falcata		BW			Lo	Mm	Mu	Be	KC	Ba					Cu				LC			SH			
Thelypteridaceae																									
Christella dentata	Bd													Gd								SH			
Cycads																									
Zamiaceae																									
Macrozamia communis	Bd	BW	Li		Lo				KC		An	Ka	Gn											Wo	La
Conifers																									
Cupressaceae																									
Callitris rhomboidea								Be	KC					Gd											
Podocarpaceae																									
Podocarpus spinulosus	Bd	BW	Li					Be					Gn	Gd				Da	LC			SH		Wo	

Dicotyledons

Acanthaceae																								
Brunoniella australis				Sp					KC														HB		
Brunoniella pumilio									KC			Ka							LC						
Pseuderanthemum variabile	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu	PH	DH		LC		Wa				
Aizoaceae																									
Carpobrotus glaucescens	Bd	BW	Li																			SH			La
Tetragonia tetragonoides	Bd		Li		Lo			Be	KC					Gd					LC			SH	HB	Wo	
Amaranthaceae																									
Alternanthera denticulata							Mu	Be																	
Apiaceae																									
Actinotus helianthi	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Actinotus minor	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH			La
Apium prostratum	Bd	BW	Li		Lo	Mm		Be	KC																La
Centella asiatica	Bd	BW								Ba		Ka					DH				Wa	SH	HB	Wo	La
Daucus glochidiatus		BW				Mm																			
Hydrocotyle geraniifolia					Lo	Mm			KC																
Hydrocotyle laxiflora		BW				Mm	Mu	Be	KC		An	Ka			Cu				LC						
Hydrocotyle peduncularis					Lo	Mm			KC	Ba												SH	HB	Wo	
Hydrocotyle tripartita							Mu	Be							Cu										
Hydrocotyle verticillata																						SH			
Platysace clelandii						Mm	Mu																		
Platysace ericoides						Mm		Be										Da							La
Platysace lanceolata	Bd	BW	Li	Sp		Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd				Da	LC	Ma		SH		Wo	La
Platysace linearifolia	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	
Platysace stephensonii									KC				Gn												La
Trachymene incisa											An								LC		Wa				
Xanthosia dissecta		BW																							
Xanthosia pilosa	Bd	BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	La
Xanthosia tridentata	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd				Da	LC	Ma		SH		Wo	La
Apocynaceae																									
Parsonsia brownii								Be																	
Parsonsia straminea	Bd	BW	Li						KC	Ba	An	Ka	Gn		Cu				LC				HB		

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Araliaceae																									
Astrotricha crassifolia		BW																							
Astrotricha floccosa		BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd				Da	LC			SH			
Astrotricha latifolia	Bd	BW				Mm													LC						
Polyscias murrayi		BW																							
Polyscias sambucifolia	Bd	BW						Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	La
Asclepiadaceae																									
Marsdenia rostrata							Mu		KC	Ba	An											SH			
Marsdenia suaveolens	Bd	BW			Lo	Mm	Mu	Be		Ba		Ka	Gn	Gd		PH		Da	LC			SH			
Tylophora barbata						Mm		Be				Ka			Cu		DH		LC				HB		
Asteraceae																									
Actites megalocarpa														Gd											
Brachycome angustifolia				Sp					KC		An						DH		LC		Wa				
Brachycome multifida						Mm																			
Bracteantha bracteata																			LC						
Calotis dentex						Mm																			
Calotis lappulacea																							HB		
Cassinia aculeata		BW	Li													PH	DH				Wa				
Cassinia arcuata																							HB		
Cassinia aureonitens	Bd					Mm								Gd											
Cassinia compacta						Mm	Mu																		
Cassinia denticulata		BW			Lo		Mu	Be	KC					Gd		PH						SH			
Cassinia longifolia	Bd	BW						Be																	
Cassinia quinquefaria																PH									
Cassinia uncata	Bd									Ba	An	Ka													
Chrysocephalum apiculatum							Mu									PH		Da					HB		
Cotula australis																						SH	HB		La
Epaltes australis	Bd	BW			Lo			Be												Ma					La
Helichrysum elatum		BW							KC			Ka		Gd		PH			LC			SH			
Helichrysum scorpioides																PH	DH				Wa	SH			
Lagenifera stipitata		BW			Lo			Be			An	Ka	Gn				DH					SH		Wo	
Leptinella longipes		BW																					HB		La
Olearia microphylla								Be							Cu	PH			LC					Wo	
Olearia tomentosa	Bd	BW					Mu		KC	Ba		Ka	Gn	Gd					LC			SH			

Olearia viscidula															Cu										
Ozothamnus diosmifolius	Bd	BW		Sp		Mm	Mu	Be			An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	
Pseudognaphalium luteoalbum			Li						KC																La
Senecio amygdalifolius																							HB		
Senecio bipinnatisectus	Bd					Mm	Mu		KC																
Senecio glomeratus																				Ma					La
Senecio hispidulus	Bd	BW						Be	KC				Gn		Cu						Wa	SH	HB	Wo	La
Senecio lautus															Cu				LC			SH	HB	Wo	La
Senecio linearifolius	Bd						Mu	Be	KC																
Senecio minimus		BW	Li					Be	KC						Cu										
Senecio quadridentatus								Be															HB		
Senecio vagus																									
subsp. *eglandulosus*	Bd									Ba			Gn												
Sigesbeckia orientalis		BW				Mm	Mu	Be	KC				Gn		Cu		DH								
Solenogyne bellioides																			LC						
Vernonia cinerea var. *cinera*	Bd					Mm			KC		An	Ka					DH						HB		
Vittadinia muelleri																							HB		
Avicenniaceae																									
Avicennia marina																									
subsp. *australasica*		BW		Sp	Lo	Mm	Mu	Be	KC					Gd					LC				HB	Wo	
Bauera microphylla																									La
Bauera rubioides	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH			
Bignoniaceae																									
Pandorea pandorana	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	
Callitrichaceae																									
Callitriche muelleri								Be																	
Campanulaceae																									
Wahlenbergia communis																							HB		
Wahlenbergia gracilis	Bd			Sp	Lo	Mm		Be		Ba	An	Ka	Gn		Cu							SH	HB	Wo	La
Wahlenbergia stricta																									
subsp. *stricta*			Li			Mm											DH		LC						
Caryophyllaceae																									
Stellaria flaccida						Mm																			

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Casuarinaceae																									
Allocasuarina distyla	Bd	BW	Li			Mm	Mu	Be	KC	Ba		Ka	Gn	Gd					LC	Ma		SH			La
Allocasuarina littoralis	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH		Wo	
Allocasuarina nana													Gn												
Allocasuarina portuensis																						SH			
Allocasuarina torulosa	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		Wa	SH	HB		
Casuarina glauca		BW		Sp	Lo	Mm	Mu	Be	KC	Ba			Gn	Gd					LC			SH	HB	Wo	La
Celastraceae																									
Cassine australis var. *australis*		BW								Ba													HB		
Celastrus subspicata																PH									
Maytenus silvestris	Bd	BW					Mu	Be	KC			Ka			Cu		DH								
Chenopodiaceae																									
Atriplex australasica																							HB		
Atriplex semibaccata																							HB		
Chenopodium glaucum		BW											Gn										HB		
Einadia hastata													Gn												
Einadia nutans subsp. *linifolia*																							HB		
Einadia nutans subsp. *nutans*							Mu												LC						
Einadia polygonoides			Li					Be																	
Einadia trigonos subsp. *trigonos*															Cu										
Halosarcia pergranulata																							HB		
Rhagodia candolleana			Li																						
Sarcocornia quinqueflora		BW			Lo			Be	KC					Gd					LC			SH	HB	Wo	
Suaeda australis								Be	KC										LC				HB	Wo	
Chloanthes stoechadis	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH						SH			La
Clusiaceae																									
Hypericum gramineum				Sp	Lo		Mu					Ka	Gn					Da				SH	HB		La
Hypericum japonicum		BW		Sp				Be							Cu				LC						
Convolvulaceae																									
Calystegia marginata													Gn												
Calystegia soldanella																									La

Cuscuta australis						Mm																			
Dichondra repens	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka			Cu		DH		LC		Wa	SH	HB		La
Polymeria calycina	Bd				Lo		Mu		KC				Gn										HB		
Wilsonia backhousei																							HB		
Crassulaceae																									
Crassula helmsii		BW																							
Crassula sieberiana	Bd	BW	Li		Lo	Mm		Be	KC	Ba	An	Ka							LC			SH		Wo	La
Cunoniaceae																									
Callicoma serratifolia		BW				Mm	Mu	Be	KC			Ka	Gn	Gd	Cu	PH		Da	LC	Ma		SH		Wo	
Ceratopetalum apetalum	Bd	BW		Sp		Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma				Wo	
Ceratopetalum gummiferum		BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	La
Schizomeria ovata	Bd	BW				Mm	Mu		KC			Ka	Gn						LC			SH			
Dilleniaceae																									
Hibbertia acicularis																									La
Hibbertia aspera	Bd	BW				Mm	Mu	Be	KC				Gn		Cu		DH		LC		Wa		HB	Wo	
Hibbertia bracteata	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd					LC						
Hibbertia circumdans						Mm	Mu																		
Hibbertia cistiflora	Bd	BW				Mm	Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Hibbertia dentata	Bd	BW	Li		Lo	Mm		Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC			SH		Wo	
Hibbertia diffusa					Lo	Mm			KC		An					PH			LC			SH		Wo	
Hibbertia empetrifolia	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			Da	LC	Ma		SH			La
Hibbertia fasciculata	Bd	BW						Be				Ka	Gn	Gd		PH				Ma		SH	HB		La
Hibbertia linearis		BW					Mu	Be	KC			Ka	Gn	Gd					LC	Ma		SH			
Hibbertia monogyna	Bd						Mu		KC																
Hibbertia nitida													Gn	Gd											
Hibbertia obtusifolia	Bd	BW	Li	Sp			Mu	Be			An							Da							
Hibbertia riparia	Bd							Be	KC														HB		
Hibbertia rufa		BW																				SH			
Hibbertia scandens	Bd	BW	Li					Be	KC	Ba			Gn	Gd	Cu		DH		LC			SH		Wo	La
Hibbertia serpyllifolia													Gn												
Droseraceae																									
Drosera auriculata	Bd	BW		Sp		Mm	Mu		KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	
Drosera binata	Bd	BW					Mu	Be	KC		An	Ka	Gn							Ma		SH			
Drosera peltata		BW				Mm	Mu	Be	KC			Ka	Gn	Gd				Da		Ma		SH			La
Drosera pygmaea		BW				Mm		Be	KC																La
Drosera spatulata	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma		SH			La

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Ebenaceae																									
Diospyros australis	Bd									Ba															
Elaeocarpaceae																									
Elaeocarpus reticulatus	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Sloanea australis												Ka										SH			
Elatinaceae																									
Elatine gratioloides													Gn												La
Epacridaceae																									
Acrotriche divaricata	Bd	BW						Be	KC			Ka	Gn	Gd			DH								
Astroloma humifusum	Bd							Be										Da				SH	HB	Wo	
Astroloma pinifolium	Bd	BW							KC													SH			La
Brachyloma daphnoides	Bd	BW			Lo	Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH		Wo	La
Dracophyllum secundum		BW		Sp	Lo	Mm	Mu	Be	KC				Gn	Gd		PH			LC						
Epacris crassifolia		BW					Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Epacris longiflora	Bd	BW		Sp		Mm	Mu	Be	KC	Ba		Ka	Gn	Gd		PH			LC	Ma		SH		Wo	La
Epacris microphylla	Bd	BW					Mu	Be	KC		An		Gn	Gd		PH			LC	Ma		SH		Wo	La
Epacris obtusifolia		BW					Mu	Be	KC			Ka	Gn	Gd						Ma		SH			La
Epacris pulchella	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	
Epacris purpurascens var. *purpurascens*		BW					Mu	Be								PH									
Epacris rigida																PH									
Leucopogon amplexicaulis		BW					Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH		Wo	
Leucopogon appressus	Bd					Mm	Mu		KC				Gn	Gd											
Leucopogon deformis	Bd																								
Leucopogon ericoides	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH			La
Leucopogon esquamatus	Bd	BW					Mu	Be	KC	Ba			Gn	Gd						Ma		SH			La
Leucopogon juniperinus	Bd							Be							Cu	PH	DH	Da	LC		Wa		HB	Wo	
Leucopogon lanceolatus								Be	KC			Ka	Gn	Gd	Cu	PH	DH	Da	LC					Wo	
Leucopogon margarodes		BW																							
Leucopogon microphyllus		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			
Leucopogon muticus						Mm		Be																	
Leucopogon parviflorus	Bd	BW								Ba															
Leucopogon setiger						Mm	Mu	Be	KC				Gn	Gd					LC						

Leucopogon virgatus																PH									La
Lissanthe sapida																			LC						
Lissanthe strigosa						Mm			KC				Gn	Gd						Ma	Wa	SH	HB		
Melichrus procumbens		BW									An							Da	LC						
Monotoca elliptica	Bd	BW	Li		Lo		Mu		KC	Ba		Ka	Gn	Gd					LC			SH		Wo	La
Monotoca scoparia	Bd	BW	Li			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd					LC	Ma		SH			La
Sprengelia incarnata	Bd	BW					Mu	Be	KC			Ka	Gn	Gd								SH			La
Styphelia laeta subsp. *laeta*	Bd	BW							KC										LC						La
Styphelia laeta subsp. *latifolia*		BW																							
Styphelia longifolia		BW							KC			Ka	Gn	Gd		PH						SH			
Styphelia triflora								Be	KC				Gn	Gd		PH		Da		Ma		SH			La
Styphelia tubiflora	Bd	BW	Li				Mu	Be	KC				Gn	Gd		PH		Da	LC	Ma		SH		Wo	
Styphelia viridus subsp. *viridus*																									La
Trochocarpa laurina	Bd	BW				Mm	Mu	Be	KC			Ka				PH			LC						
Woollsia pungens	Bd	BW			Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH			La
Escalloniaceae																									
Abrophyllum ornans		BW							KC																
Euphorbiaceae																									
Amperea xiphoclada	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu			Da	LC			SH			La
Bertya brownii												Ka	Gn												
Breynia oblongifolia	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH	Da	LC		Wa	SH	HB	Wo	La
Glochidion ferdinandi	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu				LC	Ma	Wa	SH		Wo	La
Micrantheum ericoides	Bd	BW	Li			Mm	Mu	Be	KC	Ba		Ka	Gn	Gd					LC	Ma	Wa	SH		Wo	
Monotaxis linifolia		BW					Mu					Ka	Gn	Gd						Ma		SH			La
Omalanthus populifolius	Bd								KC	Ba	An	Ka	Gn	Gd	Cu				LC		Wa	SH		Wo	
Phyllanthus gasstroemii		BW				Mm																	HB	Wo	
Phyllanthus hirtellus	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd				Da	LC	Ma	Wa	SH	HB	Wo	
Poranthera corymbosa	Bd					Mm	Mu	Be	KC				Gn						LC						
Poranthera ericifolia	Bd	BW					Mu	Be	KC			Ka	Gn	Gd								SH			La
Poranthera microphylla		BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn		Cu		DH				Wa	SH	HB	Wo	La
Pseudanthus orientalis	Bd																					SH			La
Pseudanthus pimeleoides		BW											Gn												
Ricinocarpos pinifolius	Bd	BW						Be	KC		An	Ka	Gn	Gd		PH			LC	Ma		SH			La
Eupomatiaceae																									
Eupomatia laurina	Bd	BW				Mm					An	Ka													

Botanical name	**Bd**	**BW**	**Li**	**Sp**	**Lo**	**Ma**	**Mu**	**Be**	**KC**	**Ba**	**An**	**Ka**	**Gn**	**Gd**	**Cu**	**PH**	**DH**	**Da**	**LC**	**Ma**	**Wa**	**SH**	**HB**	**Wo**	**La**
Fabaceae–Faboideae																									
Almaleea paludosa		BW							KC																La
Aotus ericoides	Bd	BW					Mu	Be	KC		An		Gn	Gd										Wo	La
Bossiaea ensata	Bd	BW						Be	KC		An		Gn									SH			La
Bossiaea heterophylla	Bd	BW	Li			Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	La
Bossiaea lenticularis						Mm																			
Bossiaea obcordata		BW				Mm		Be	KC				Gn	Gd		PH		Da	LC		Wa				
Bossiaea prostrata																							HB		
Bossiaea rhombifolia								Be																	
Bossiaea scolopendria	Bd	BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			La
Bossiaea stephensonii		BW				Mm																			
Daviesia alata		BW							KC																
Daviesia corymbosa	Bd					Mm	Mu	Be																	
Daviesia ulicifolia	Bd	BW					Mu	Be							Cu					Ma	Wa	SH	HB		
Desmodium brachypodum	Bd					Mm																			
Desmodium rhytidophyllum		BW			Lo		Mu		KC		An		Gn				DH								
Desmodium varians		BW			Lo	Mm	Mu	Be	KC	Ba		Ka	Gn		Cu										
Dillwynia acicularis							Mu																		
Dillwynia floribunda var. *floribunda*	Bd	BW		Sp		Mm	Mu	Be	KC			Ka	Gn	Gd						Ma		SH			La
Dillwynia floribunda var. *teretifolia*						Mm	Mu	Be	KC				Gn	Gd		PH									
Dillwynia glaberrima	Bd															PH						SH			La
Dillwynia parvifolia																							HB		
Dillwynia retorta	Bd	BW	Li		Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH			La
Dillwynia sericea (D. rudis)	Bd	BW				Mm		Be					Gn	Gd					LC						
Glycine clandestina species complex		BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka				PH			LC		Wa	SH	HB		La
Glycine microphylla													Gn												
Glycine tabacina species complex	Bd							Be	KC		An			Gd		PH	DH					SH	HB		
Gompholobium glabratum		BW				Mm	Mu	Be	KC					Gd		PH		Da	LC	Ma					La
Gompholobium grandiflorum	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC			SH			
Gompholobium latifolium	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma		SH			
Gompholobium minus									KC														HB		
Gompholobium pinnatum					Lo														LC						

Gompholobium virgatum	Bd																								
Goodia lotifolia						Mm																			
Hardenbergia violacea	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Hovea lanceolata								Be																	
Hovea linearis		BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH			
Hovea longifolia								Be					Gn										HB		
Hovea purpurea						Mm																			
Indigofera australis	Bd	BW				Mm		Be							Cu		DH						HB		
Jacksonia scoparia	Bd					Mm				Ba															
Kennedia rubicunda	Bd	BW	Li	Sp		Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	La
Mirbelia rubiifolia		BW	Li	Sp		Mm	Mu		KC	Ba			Gn	Gd					LC		Wa	SH			La
Mirbelia speciosa																									
subsp. *speciosa*						Mm			KC																
Oxylobium cordifolium																									La
Oxylobium ilicifolium	Bd	BW	Li			Mm			KC	Ba	An	Ka	Gn					Da					HB		
Oxylobium scandens																									
var. *scandens*							Mu								Cu										
Phyllota grandiflora								Be	KC			Ka		Gd				Da							
Phyllota phylicoides		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			
Platylobium formosum	Bd	BW			Lo		Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	
Pultenaea daphnoides	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Pultenaea dentata																									La
Pultenaea elliptica	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma		SH			
Pultenaea ferruginea																									
var. *deanei*	Bd	BW	Li			Mm				Ba															
Pultenaea ferruginea																									
var. *ferruginea*						Mm	Mu																		
Pultenaea flexilis	Bd	BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma					
Pultenaea hispidula									KC				Gn							Ma					
Pultenaea linophyla							Mu	Be	KC				Gn	Gd						Ma				Wo	La
Pultenaea microphylla													Gn												
Pultenaea paleacea																PH									
Pultenaea polifolia							Mu		KC				Gn	Gd						Ma					
Pultenaea retusa				Sp				Be													Wa	SH			
Pultenaea rosmarinifolia		BW				Mm			KC	Ba						PH									
Pultenaea scabra								Be														SH			
Pultenaea stipularis								Be	KC				Gn	Gd		PH			LC	Ma		SH			
Pultenaea villosa								Be															HB		

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Sphaerolobium vimineum		BW						Be	KC							PH									La
Viminaria juncea		BW			Lo		Mu	Be	KC				Gn	Gd		PH			LC	Ma	Wa	SH		Wo	La
Zornia dyctiocarpa var. *dyctiocarpa*																PH									
Fabaceae–Mimosoideae																									
Acacia binervia													Gn	Gd					LC					Wo	
Acacia brownii						Mm														Ma					
Acacia buxifolia subsp. *buxifolia*								Be											LC						
Acacia decurrens						Mm	Mu	Be								PH		Da					HB		
Acacia echinula							Mu												LC						
Acacia elata	Bd	BW		Sp		Mm								Gd		PH			LC						
Acacia elongata var. *elongata*								Be												Ma					
Acacia falcata															Cu			Da			Wa		HB	Wo	
Acacia filicifolia	Bd					Mm																			
Acacia fimbriata		BW																							
Acacia floribunda		BW				Mm	Mu	Be	KC		An				Cu	PH	DH	Da						Wo	
Acacia hispidula						Mm		Be						Gd					LC					Wo	
Acacia implexa	Bd	BW			Lo	Mm	Mu		KC	Ba			Gn				DH					SH			La
Acacia irrorata subsp. *irrorata*	Bd	BW						Be					Gn	Gd											
Acacia linifolia		BW				Mm	Mu	Be				Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	
Acacia longifolia		BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	
Acacia longissima						Mm		Be	KC			Ka	Gn	Gd		PH	DH			Ma		SH	HB		
Acacia maidenii	Bd	BW		Sp											Cu										
Acacia myrtifolia	Bd	BW				Mm	Mu	Be	KC	Ba	An		Gn	Gd				Da	LC	Ma	Wa	SH	HB	Wo	La
Acacia oxycedrus	Bd	BW		Sp			Mu	Be	KC			Ka	Gn			PH									
Acacia parramattensis		BW				Mm		Be			An			Gd	Cu	PH			LC		Wa		HB	Wo	
Acacia parvipinnula								Be							Cu										
Acacia prominens		BW																							
Acacia quadrilateralis	Bd																								
Acacia schinoides		BW																							
Acacia sophorae	Bd																						HB		La
Acacia stricta													Gn		Cu	PH					Wa		HB		
Acacia suaveolens	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Acacia terminalis		BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma	Wa	SH		Wo	La
Acacia ulicifolia	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	La
Pararchidendron pruinosum										Ba															

Flacourtiaceae																								
Scolopia braunii	Bd																							
Gentianaceae																								
Centaurium spicatum																							HB		
Geraniaceae																								
Erodium crinitum																									La
Geranium homeanum					Lo		Mu		KC						Cu				LC			SH			
Geranium potentilloides						Mm																			
Geranium solanderi																									
var. *solanderi*		BW						Be							Cu		DH								
Pelargonium australe	Bd	BW																							La
Pelargonium inodorum	Bd	BW								Ba		Ka												Wo	
Goodeniaceae																								
Dampiera purpurea						Mm	Mu	Be	KC										LC						
Dampiera scottiana						Mm																			
Dampiera stricta	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma		SH			La
Goodenia bellidifolia	Bd	BW	Li				Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH			La
Goodenia dimorpha																									
var. *dimorpha*		BW							KC										LC	Ma	Wa				
Goodenia hederacea					Lo				KC							PH		Da	LC		Wa		HB	Wo	
Goodenia heterophylla	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC			SH			
Goodenia ovata		BW	Li		Lo	Mm		Be	KC	Ba	An	Ka	Gn						LC				HB		La
Goodenia paniculata		BW			Lo								Gn										HB		
Goodenia stelligera						Mm							Gn			PH				Ma		SH			La
Scaevola albida								Be																	
Scaevola ramosissima	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma					La
Selliera radicans																									La
Velleia lyrata		BW						Be	KC													SH			
Haloragaceae																								
Gonocarpus micranthus		BW					Mu	Be			An	Ka	Gn	Gd					LC	Ma		SH			La
Gonocarpus salsoloides		BW						Be												Ma		SH			La
Gonocarpus tetragynus		BW					Mu	Be	KC					Gd				Da			Wa	SH	HB		La
Gonocarpus teucrioides	Bd	BW			Lo	Mm	Mu	Be	KC	Ba		Ka	Gn	Gd	Cu			Da	LC	Ma		SH		Wo	La
Haloragodendron lucasii														Gd											

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Lamiaceae																									
Hemigenia purpurea		BW					Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			
Lycopus australis							Mu																		
Plectranthus graveolens				Sp																					
Plectranthus parviflorus	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu		DH					SH			
Prostanthera denticulata									KC	Ba		Ka	Gn	Gd											
Prostanthera incana							Mu																		
Prostanthera linearis	Bd	BW				Mm	Mu	Be	KC				Gn	Gd					LC						
Prostanthera ovalifolia s. lat.					Lo	Mm	Mu	Be																	
Prostanthera rhombea		BW				Mm																			
Westringia fruticosa	Bd	BW	Li							Ba												SH			La
Lauraceae																									
Cassytha glabella	Bd		Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC			SH	HB		La
Cassytha pubescens		BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH	DH	Da	LC	Ma	Wa	SH	HB		La
Cryptocarya glaucescens		BW										Ka													
Endiandra sieberi	Bd	BW	Li		Lo				KC			Ka	Gn									SH			La
Lentibulariaceae																									
Utricularia biloba																									La
Utricularia dichotoma		BW						Be	KC											Ma		SH			La
Utricularia lateriflora	Bd	BW						Be				Ka													
Utricularia uliginosa		BW																							La
Lobeliaceae																									
Lobelia alata	Bd	BW	Li		Lo	Mm	Mu		KC	Ba	An			Gd					LC	Ma		SH		Wo	La
Lobelia dentata		BW						Be	KC			Ka	Gn	Gd				Da		Ma		SH			
Lobelia gibbosa		BW										Ka				PH									
Lobelia gracilis																					Wa	SH		Wo	
Pratia purpurascens	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	
Loganiaceae																									
Logania albiflora	Bd	BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH				Ma		SH		Wo	
Logania pusilla							Mu					Ka													
Mitrasacme polymorpha	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd				Da	LC	Ma		SH			La

Loranthaceae																						
Amyema congener																PH	LC				Wo	
Amyema gaudichaudii																		HB				
Amyema miquelii		BW																				
Amyema pendulum subsp. *pendulum*	Bd																					
Dendrophthoe vitellina	Bd						Mu	Be								PH	LC		SH	HB	Wo	
Muellerina celastroides		BW	Li		Lo		Mu			Ba									SH			
Muellerina eucalyptoides	Bd	BW					Mu							Gd								
Lythraceae																						
Lythrum hyssopifolia																				HB		
Malvaceae																						
Hibiscus diversifolius													Gn									
Howittia trilocularis	Bd	BW																				
Meliaceae																						
Melia azedarach								Be	KC				Gn		Cu							
Synoum glandulosum	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn				LC		SH			
Toona ciliata (Toona australis)									KC													
Menispermaceae																						
Sarcopetalum harveyanum	Bd	BW		Sp	Lo		Mu	Be	KC	Ba	An	Ka	Gn		Cu		LC		SH	HB	Wo	La
Stephania japonica var. *discolor*	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn			PH	LC		SH			La
Menyanthaceae																						
Villarsia exaltata													Gn									
Monimiaceae																						
Doryphora sassafras		BW																				
Palmeria scandens		BW						Be														
Wilkiea huegeliana	Bd	BW							KC	Ba	An	Ka										
Moraceae																						
Ficus coronata	Bd	BW					Mu	Be	KC	Ba			Gn				LC					
Ficus rubiginosa	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			SH		Wo	
Ficus superba var. *henneana*		BW																				
Malaisia scandens	Bd																					

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Myoporaceae																									
Eremophila debilis																							HB		
Myoporum acuminatum	Bd	BW					Mu																		
Myoporum insulare	Bd	BW													Cu								HB		
Myrsinaceae																									
Aegiceras corniculatum	Bd	BW			Lo	Mm	Mu	Be	KC										LC				HB		
Rapanea howittiana	Bd	BW	Li				Mu			Ba		Ka										SH			La
Rapanea variabilis	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH					SH	HB	Wo	La
Myrtaceae																									
Acmena smithii	Bd	BW	Li	Sp		Mm	Mu	Be	KC	Ba	An	Ka	Gn			PH		Da	LC			SH			La
Angophora bakeri					Lo	Mm	Mu	Be										Da	LC		Wa				
Angophora costata	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da		Ma	Wa	SH		Wo	La
Angophora crassifolia									KC				Gn	Gd					LC	Ma					
Angophora floribunda	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An				Cu		DH		LC				HB	Wo	
Angophora hispida	Bd	BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			
Austromyrtus tenuifolia		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma					
Backhousia myrtifolia	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba		Ka	Gn	Gd		PH		Da	LC						
Baeckea brevifolia	Bd	BW				Mm	Mu	Be	KC				Gn						LC			SH			
Baeckea densifolia													Gn	Gd		PH				Ma					
Baeckea diosmifolia	Bd	BW				Mm	Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Baeckea imbricata	Bd	BW	Li				Mu	Be	KC	Ba			Gn	Gd						Ma		SH			La
Baeckea linifolia		BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH				Ma					
Baeckea ramosissima	Bd												Gn	Gd					LC			SH			
Baeckea virgata					Lo			Be					Gn						LC						
Callistemon citrinus	Bd	BW					Mu	Be	KC		An		Gn	Gd		PH			LC	Ma		SH		Wo	La
Callistemon linearifolius			Li	Sp			Mu		KC				Gn												
Callistemon linearis	Bd	BW					Mu	Be	KC	Ba		Ka	Gn	Gd					LC	Ma	Wa	SH		Wo	La
Callistemon pinifolius													Gn												La
Callistemon rigidus												Ka	Gn							Ma					
Callistemon salignus													Gn						LC			SH			
Calytrix tetragona	Bd	BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			La
Darwinia biflora						Mm		Be	KC										LC						
Darwinia fascicularis		BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd					LC	Ma		SH			La
Darwinia glaucophylla		BW																							

Darwinia leptantha																					SH			La
Darwinia peduncularis						Mm		Be																	
Darwinia procera		BW				Mm			KC				Gn	Gd											
Eucalyptus acmenoides		BW				Mm									Cu										
Eucalyptus agglomerata						Mm			KC																
Eucalyptus beyeriana						Mm																			
Eucalyptus botryoides	Bd	BW	Li						KC	Ba	An		Gn									SH		Wo	La
Eucalyptus camfieldii								Be	KC													SH			
Eucalyptus capitellata	Bd	BW						Be	KC				Gn	Gd						Ma					
Eucalyptus deanei	Bd	BW																							
Eucalyptus eugenioides						Mm																			
Eucalyptus eximia		BW				Mm	Mu	Be	KC	Ba															
Eucalyptus fibrosa																							HB		
Eucalyptus globoidea		BW				Mm		Be								PH		Da			Wa	SH	HB		
Eucalyptus grandis													Gn												
Eucalyptus gummifera	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	La
Eucalyptus haemastoma	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma	Wa	SH	HB	Wo	
Eucalyptus longifolia																							HB		
Eucalyptus luehmanniana		BW							KC				Gn	Gd											
Eucalyptus maculata	Bd	BW							KC		An														
Eucalyptus moluccana																							HB		
Eucalyptus multicaulis	Bd	BW						Be						Gd											
Eucalyptus oblonga		BW						Be	KC				Gn	Gd						Ma					
Eucalyptus obstans													Gn							Ma		SH			
Eucalyptus paniculata	Bd	BW	Li					Be	KC		An	Ka	Gn	Gd	Cu	PH	DH		LC		Wa		HB		
Eucalyptus pilularis	Bd					Mm		Be	KC					Gd	Cu	PH	DH	Da					HB	Wo	
Eucalyptus piperita	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	
Eucalyptus punctata	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd						Ma	Wa	SH	HB		
Eucalyptus racemosa						Mm	Mu	Be	KC				Gn	Gd						Ma					
Eucalyptus resinifera		BW		Sp		Mm		Be	KC						Cu	PH			LC		Wa		HB		
Eucalyptus robusta	Bd										An		Gn									SH		Wo	La
Eucalyptus saligna								Be						Gd	Cu		DH	Da	LC						
Eucalyptus scias subsp. *scias*	Bd	BW							KC			Ka	Gn												
Eucalyptus sclerophylla						Mm																			
Eucalyptus sieberi		BW					Mu	Be	KC				Gn	Gd						Ma					
Eucalyptus sparsifolia						Mm																			
Eucalyptus squamosa		BW				Mm	Mu	Be	KC				Gn												
Eucalyptus tereticornis						Mm									Cu				LC			SH			

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Eucalyptus umbra	Bd	BW		Sp	Lo		Mu		KC		An	Ka	Gn	Gd				Da		Ma		SH			
Kunzea ambigua	Bd	BW	Li	Sp	Lo		Mu	Be	Kc	Ba	An	Ka		Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	La
Kunzea capitata		BW				Mm	Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Kunzea rupestris						Mm			KC																
Leptospermum arachnoides		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			La
Leptospermum deanei						Mm								Gd		PH									
Leptospermum grandifolium		BW				Mm		Be					Gn	Gd						Ma					
Leptospermum juniperinum	Bd	BW					Mu		KC		An	Ka	Gn	Gd						Ma		SH			La
Leptospermum laevigatum	Bd	BW	Li							Ba				Gd					LC			SH			La
Leptospermum parvifolium		BW				Mm			KC					Gd						Ma					
Leptospermum polygalifolium	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	La
Leptospermum scoparium	Bd	BW																							
Leptospermum squarrosum	Bd	BW				Mm	Mu	Be	KC	Ba		Ka	Gn	Gd					LC	Ma		SH			La
Leptospermum trinervium	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Melaleuca armillaris																						SH			La
Melaleuca biconvexa	Bd																								
Melaleuca deanei		BW						Be						Gd											
Melaleuca decora																					Wa				
Melaleuca ericifolia					Lo																			Wo	
Melaleuca hypericifolia										Ba								Da				SH			
Melaleuca linariifolia	Bd						Mu	Be					Gn											Wo	La
Melaleuca nodosa																PH						SH	HB	Wo	La
Melaleuca quinquenervia					Lo																	SH			
Melaleuca squamea																									La
Melaleuca styphelioides	Bd	BW											Gn	Gd							Wa		HB	Wo	
Melaleuca thymifolia	Bd															PH								Wo	La
Micromyrtus blakelyi						Mm	Mu																		
Micromyrtus ciliata	Bd					Mm	Mu	Be	KC					Gd					LC	Ma					
Rhodamnia rubescens	Bd					Mm			KC								DH								
Rhodomyrtus psidioides										Ba															
Syncarpia glomulifera	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka		Gd	Cu	PH	DH	Da	LC		Wa	SH	HB	Wo	
Syzigium australe																						SH			
Syzigium oleosum	Bd	BW								Ba			Gn												
Syzygium paniculatum																								Wo	
Tristania neriifolia		BW					Mu	Be					Gn	Gd		PH									
Tristaniopsis collina	Bd				Lo			Be	KC	Ba				Gd								SH		Wo	
Tristaniopsis laurina	Bd	BW		Sp		Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC					Wo	

Olacaceae																									
Olax stricta		BW				Mm	Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Oleaceae																									
Notelaea longifolia	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH	Da	LC		Wa	SH	HB	Wo	La
Notelaea ovata								Be	KC				Gn									SH		Wo	
Notelaea venosa	Bd	BW				Mm			KC																
Onagraceae																									
Epilobium billardierianum								Be	KC														HB	Wo	
Ludwigia peploides																							HB		
Oxalidaceae																									
Oxalis exilis																	DH								
Oxalis rubens													Gn												
Oxalis thompsoniae										Ba															
Passifloraceae																									
Passiflora cinnabarina												Ka													
Passiflora herbertiana							Mu		KC						Cu				LC						
Peperomiaceae																									
Peperomia blanda var. *floribunda*					Lo																				
Peperomia tetraphylla		BW																							
Pittosporaceae																									
Billardiera scandens var. *scandens*	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Bursaria spinosa var. *spinosa*		BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn		Cu	PH	DH				Wa		HB	Wo	
Citriobatus pauciflorus	Bd	BW				Mm									Cu										
Pittosporum revolutum	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu	PH	DH	Da	LC			SH	HB	Wo	La
Pittosporum undulatum	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB		La
Rhytidosporum procumbens						Mm	Mu	Be	KC				Gn	Gd		PH			LC						
Plantaginaceae																									
Plantago debilis		BW																							
Plantaginaceae																									
Plantago hispida	Bd		Li																						

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Polygalaceae																									
Comesperma defoliatum									KC										LC						
Comesperma ericinum	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH			La
Comesperma sphaerocarpum		BW							KC			Ka	Gn												
Comesperma volubile		BW				Mm	Mu	Be	KC			Ka	Gn			PH		Da							
Polygonaceae																									
Muehlenbeckia gracillima		BW					Mu							Gd											
Persicaria decipiens		BW					Mu	Be	KC		An		Gn									SH	HB	Wo	La
Persicaria hydropiper								Be			An		Gn												
Persicaria lapathifolia									KC															Wo	
Persicaria praetermissa							Mu																		
Persicaria strigosa													Gn											Wo	
Polygonum plebeium																							HB		
Rumex brownii		BW	Li				Mu	Be																	
Portulacaceae																									
Calandrinia pickeringii			Li		Lo	Mm			KC			Ka							LC			SH			
Portulaca oleracea		BW						Be																	
Primulaceae																									
Samolus repens		BW			Lo	Mm	Mu	Be	KC				Gn	Gd					LC				HB		La
Proteaceae																									
Banksia aemula	Bd																					SH			La
Banksia ericifolia var. *ericifolia*	Bd	BW	Li			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC	Ma		SH			La
Banksia integrifolia	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC			SH		Wo	La
Banksia marginata				Sp		Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma		SH			
Banksia oblongifolia	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC	Ma		SH		Wo	La
Banksia robur		BW							KC													SH			La
Banksia serrata	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Banksia spinulosa var. *collina*	Bd							Be																	
Banksia spinulosa var. *spinulosa*		BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	
Conospermum longifolium	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH				Ma		SH			
Conospermum taxifolium	Bd	BW						Be	KC				Gn	Gd		PH			LC	Ma		SH			La
Conospermum tenuifolium		BW							KC																

Grevillea buxifolia subsp. *buxifolia*		BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	
Grevillea buxifolia subsp. *sphacelata*																						SH			
Grevillea caleyi									KC				Gn	Gd											
Grevillea linearifolia	Bd	BW						Be	KC		An		Gn	Gd		PH		Da	LC	Ma		SH	HB		
Grevillea linearifolia (*G. parviflora*)						Mm																			
Grevillea mucronulata						Mm			KC													SH			
Grevillea sericea		BW		Sp		Mm	Mu	Be	KC		An	Ka	Gn			PH		Da	LC	Ma	Wa	SH		Wo	
Grevillea shiressii		BW																							
Grevillea speciosa		BW				Mm		Be	KC		An		Gn	Gd		PH		Da	LC	Ma		SH			
Hakea bakeriana						Mm		Be											LC						
Hakea dactyloides	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma		SH		Wo	La
Hakea gibbosa	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC	Ma		SH			La
Hakea propinqua		BW				Mm	Mu	Be	KC				Gn	Gd					LC						
Hakea salicifolia		BW						Be			An		Gn	Gd				Da	LC						
Hakea sericea	Bd	BW	Li			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC		Wa	SH		Wo	
Hakea teretifolia	Bd	BW	Li			Mm	Mu	Be	KC	Ba		Ka	Gn	Gd		PH			LC	Ma		SH			La
Isopogon anemonifolius	Bd	BW				Mm	Mu	Be	KC		An		Gn		Cu	PH		Da	LC					Wo	La
Isopogon anethifolius	Bd	BW	Li				Mu	Be	KC	Ba			Gn	Gd	Cu	PH		Da	LC	Ma		SH			
Lambertia formosa	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma		SH		Wo	La
Lomatia myricoides		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC						
Lomatia silaifolia	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH		Wo	La
Persoonia hirsuta subsp. *hirsuta*							Mu																		
Persoonia isophylla	Bd	BW							KC																
Persoonia lanceolata	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd					LC	Ma	Wa	SH			La
Persoonia laurina subsp. *laurina*						Mm		Be	KC				Gn			PH		Da	LC	Ma	Wa			Wo	
Persoonia levis	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH	DH	Da	LC	Ma	Wa	SH		Wo	La
Persoonia linearis	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH		Wo	
Persoonia mollis subsp. *mollis*									KC																
Persoonia pinifolia		BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma					
Petrophile pulchella	Bd	BW	Li			Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma		SH			La
Petrophile sessilis	Bd																		LC						
Stenocarpus salignus		BW				Mm	Mu	Be	KC			Ka	Gn	Gd				Da	LC						
Symphionema paludosum		BW												Gd											
Telopea speciosissima	Bd	BW					Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma		SH			
Xylomelum pyriforme	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Ranunculaceae																									
Clematis aristata	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH	DH	Da	LC			SH	HB		
Clematis glycinoides var. *glycinoides*							Mu	Be	KC	Ba	An				Cu	PH	DH		LC		Wa	SH	HB	Wo	
Ranunculus inundatus													Gn												
Ranunculus plebeius							Mu							Gd											
Rhamnaceae																									
Alphitonia excelsa		BW				Mm	Mu		KC			Ka													
Cryptandra amara var. *amara*						Mm	Mu	Be		Ba			Gn	Gd								SH			La
Cryptandra ericoides		BW							KC				Gn	Gd								SH			
Pomaderris aspera								Be								PH									
Pomaderris discolor						Mm		Be											LC					Wo	
Pomaderris eliptica		BW		Sp				Be					Gn	Gd		PH				Ma		SH			
Pomaderris ferruginea	Bd	BW				Mm			KC				Gn	Gd	Cu							SH	HB		
Pomaderris intermedia		BW	Li		Lo	Mm	Mu	Be					Gn	Gd									HB	Wo	
Pomaderris lanigera	Bd						Mu	Be	KC	Ba	An	Ka	Gn										HB		
Pomaderris ligustrina		BW																							
Rosaceae																									
Rubus hillii	Bd	BW				Mm	Mu		KC		An		Gn									SH			
Rubus parvifolius		BW	Li			Mm				Ba							DH								
Rubus rosifolius	Bd					Mm			KC						Cu										
Rubiaceae																									
Canthium coprosmoides		BW							KC			Ka													
Coprosma quadrifida								Be																	
Galium binifolium		BW						Be	KC			Ka			Cu			Da							
Galium propinquum		BW				Mm	Mu																		
Morinda jasminoides	Bd	BW		Sp			Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da				SH			
Opercularia aspera	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			Da	LC	Ma		SH	HB	Wo	La
Opercularia diphylla									KC														HB		
Opercularia hispida					Lo		Mu		KC																
Opercularia varia		BW					Mu	Be	KC			Ka	Gn					Da	LC	Ma		SH	HB		La
Pomax umbellata	Bd	BW			Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			Da	LC	Ma	Wa	SH	HB	Wo	La
Psychotria loniceroides	Bd																								

Rutaceae																							
Acronychia oblongifolia																				SH			
Asterolasia correifolia	Bd	BW				Mm	Mu		KC			Ka	Gn										
Asterolasia elegans						Mm																	
Boronia anemonifolia		BW				Mm																	
Boronia floribunda								Be	KC					Gd		PH							
Boronia fraseri		BW				Mm	Mu	Be	KC														
Boronia ledifolia		BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC	Ma	SH			
Boronia mollis								Be				Ka											
Boronia parviflora		BW						Be															La
Boronia pinnata		BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma			
Boronia polygalifolia		BW																	LC				
Boronia rigens							Mu																La
Boronia serrulata		BW				Mm	Mu	Be	KC				Gn										
Boronia thujona												Ka	Gn	Gd									
Correa alba var. *alba*										Ba											SH		La
Correa lawrenciana var. *macrocalyx*		BW																					
Correa reflexa	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba		Ka	Gn			PH		Da	LC		SH		La
Crowea saligna	Bd	BW							KC			Ka	Gn	Gd						Ma	SH		
Eriostemon australasius	Bd	BW	Li			Mm	Mu	Be	KC			Ka	Gn	Gd				Da		Ma	SH		La
Eriostemon buxifolius		BW	Li						KC					Gd							SH		La
Eriostemon hispidulus	Bd					Mm	Mu	Be															
Eriostemon myoporoides																							La
Eriostemon scaber subsp. *scaber*																						Wo	
Phebalium dentatum		BW					Mu	Be	KC			Ka	Gn	Gd		PH			LC				
Phebalium diosmeum								Be													SH	Wo	
Phebalium squamulosum subsp. *argenteum*		BW																					
Phebalium squamulosum subsp. *squamulosum*		BW				Mm	Mu		KC				Gn	Gd						Ma			
Philotheca salsolifolia		BW					Mu	Be	KC				Gn	Gd					LC	Ma	SH		La
Zieria involucrata						Mm																	
Zieria laevigata		BW				Mm	Mu	Be	KC				Gn	Gd						Ma	SH		La
Zieria pilosa	Bd	BW				Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC		SH	Wo	La
Zieria smithii subsp. *A*	Bd	BW						Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC		HB	Wo	

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Sambucaceae																									
Sambucus gaudichaudiana								Be																	
Santalaceae																									
Exocarpos cupressiformis	Bd	BW	Li	Sp	Lo	Mm	Mu		KC		An	Ka			Cu		DH	Da	LC		Wa	SH	HB	Wo	La
Exocarpos strictus								Be																	
Leptomeria acida		BW			Lo		Mu	Be	KC			Ka	Gn			PH			LC						
Sapindaceae																									
Alectryon subcinereus		BW																							
Cupaniopsis anacardioides																						SH			
Dodonaea camfieldii		BW																							
Dodonaea pinnata		BW				Mm	Mu		KC				Gn												
Dodonaea triquetra	Bd	BW	Li			Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH		LC	Ma	Wa	SH	HB	Wo	La
Guioa semiglauca	Bd	BW								Ba															
Scrophulariaceae																									
Veronica calycina								Be														SH		Wo	
Veronica plebeia		BW				Mm	Mu	Be			An			Gd	Cu		DH	Da	LC		Wa	SH	HB		
Solanaceae																									
Duboisia myoporoides	Bd	BW				Mm							Gn												
Solanum americanum (*S. nodiflorum*)		BW	Li			Mm		Be		Ba	An	Ka			Cu	PH									La
Solanum campanulatum		BW					Mu		KC																
Solanum opacum (*S. nigrum*)								Be					Gn		Cu							SH			La
Solanum prinophyllum		BW				Mm	Mu	Be	KC		An	Ka			Cu										
Solanum pungetium		BW				Mm									Cu										
Stackhousiaceae																									
Stackhousia monogyna		BW																							
Stackhousia nuda		BW							KC				Gn			PH									La
Stackhousia viminea		BW				Mm	Mu	Be	KC			Ka	Gn	Gd					LC	Ma			HB		

Sterculiaceae																									
Brachychiton populneus	Bd																						HB		
Lasiopetalum ferrugineum	Bd	BW		Sp		Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da		Ma	Wa	SH			La
Lasiopetalum macrophyllum		BW		Sp		Mm			KC	Ba															
Lasiopetalum parviflorum								Be										Da					HB		
Lasiopetalum rufum						Mm	Mu		KC					Gd											
Rulingia dasyphylla									KC				Gn						LC						
Rulingia hermanniifolia	Bd																					SH			La
Seringia arborescens									KC																
Stylidiaceae																									
Stylidium graminifolium																									La
Stylidium lineare		BW					Mu	Be	KC				Gn	Gd					LC	Ma		SH			
Stylidium productum		BW	Li		Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma	Wa			Wo	
Symplocaceae																									
Symplocos thwaitesii		BW																							
Thymelaeaceae																									
Pimelea curviflora var. *curviflora*																				Ma					
Pimelea curviflora var. *gracilis*							Mu																		
Pimelea glauca		BW																							
Pimelea latifolia subsp. *hirsuta*		BW							KC																
Pimelea linifolia subsp. *linifolia*	Bd	BW					Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH		Wo	La
Wikstroemia indica	Bd	BW	Li							Ba												SH			
Tetratheca ericifolia	Bd	BW					Mu	Be	KC			Ka	Gn	Gd						Ma					
Tetratheca glandulosa						Mm	Mu	Be	KC				Gn	Gd				Da	LC	Ma					
Tetratheca shiressii		BW																							
Tetratheca thymifolia	Bd	BW				Mm	Mu	Be	KC		An	Ka	Gn												
Ulmaceae																									
Trema aspera		BW				Mm	Mu	Be	KC		An	Ka	Gn						LC					Wo	
Urticaceae																									
Urtica incisa								Be																	
Verbenaceae																									
Clerodendrum tomentosum	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu		DH		LC			SH	HB		

Botanical name	**Bd**	**BW**	**Li**	**Sp**	**Lo**	**Ma**	**Mu**	**Be**	**KC**	**Ba**	**An**	**Ka**	**Gn**	**Gd**	**Cu**	**PH**	**DH**	**Da**	**LC**	**Ma**	**Wa**	**SH**	**HB**	**Wo**	**La**
Violaceae																									
Hybanthus monopetalus	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC							PH			LC						La
Hybanthus vernonii																									
subsp. *vernonii*						Mm	Mu	Be				Ka	Gn	Gd											
Hymenanthera dentata								Be																	
Viola betonicifolia	Bd																								
Viola hederacea		BW				Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH		Da	LC			SH	HB		La
Viola sieberiana							Mu						Gn	Gd											
Vitaceae																									
Cayratia clematidea	Bd	BW		Sp	Lo	Mm	Mu	Be	KC		An				Cu	PH							HB		
Cissus antarctica	Bd	BW	Li						KC	Ba												SH			
Cissus hypoglauca	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC			SH			La
Winteraceae																									
Tasmannia insipida		BW							KC																
Monocotyledons																									
Agavaceae																									
Doryanthes excelsa		BW				Mm																			
Amaryllidaceae																									
Crinum pedunculatum			Li																						La
Anthericaceae (Liliaceae)																									
Alania endlicheri		BW																							
Arthropodium milleflorum									KC						Cu										
Arthropodium minus		BW			Lo																				
Caesia parviflora								Be					Gn	Gd		PH			LC					Wo	
Caesia vittata		BW	Li	Sp		Mm			KC		An	Ka					DH	Da		Ma					
Laxmannia gracilis		BW						Be						Gd					LC	Ma			HB		
Sowerbaea juncea	Bd	BW							KC					Gd						Ma					La
Thysanotus juncifolius	Bd	BW			Lo		Mu		KC		An			Gd		PH		Da				SH			
Thysanotus tuberosus		BW		Sp			Mu						Gn			PH		Da	LC	Ma		SH			La
Tricoryne elatior		BW			Lo		Mu																		
Tricoryne simplex								Be										Da	LC						

Araceae																						
Gymnostachys anceps	Bd	BW			Lo	Mm	Mu		KC			Ka										
Archontophoenix cunninghamiana	Bd																					
Livistona australis	Bd	BW				Mm	Mu		KC	Ba	An	Ka	Gn							SH		Wo	
Asphodeliaceae (Liliaceae)																							
Bulbine bulbosa								Be															
Centrolepidaceae																							
Centrolepis fascicularis												Ka								SH			La
Centrolepis strigosa								Be						Gd						SH		Wo	La
Colchicaceae (Liliaceae)																							
Burchardia umbellata		BW					Mu	Be	KC		An	Ka		Gd		PH		LC	Ma	SH		Wo	La
Commelinaceae																							
Aneilema acuminatum						Mm																	
Commelina cyanea	Bd		Li		Lo	Mm	Mu	Be	KC	Ba	An		Gn			PH		LC		SH	HB	Wo	La
Cyperaceae																							
Baumea acuta		BW																		SH			La
Baumea articulata					Lo								Gn										
Baumea gunnii																							La
Baumea juncea		BW		Sp	Lo	Mm	Mu		KC				Gn	Gd				LC		SH			La
Baumea muelleri												Ka											
Baumea nuda (Schoenus nudus)												Ka							Ma				La
Baumea rubiginosa		BW					Mu		KC		An			Gd				LC					La
Baumea teretifolia																							La
Bolboschoenus caldwelli																					HB		
Carex appressa	Bd	BW					Mu													SH			
Carex breviculmis									KC						Cu								
Carex fascicularis							Mu																
Carex pumila																							La
Caustis flexuosa	Bd	BW		Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH	Da	LC	Ma	SH			
Caustis pentandra	Bd	BW	Li			Mm	Mu	Be	KC				Gn	Gd				LC	Ma	SH			La
Chorizandra cymbaria		BW											Gn	Gd									La
Chorizandra sphaerocephala		BW																					La

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Cyathochaeta diandra	Bd	BW			Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH		Da	LC	Ma	Wa	SH	HB		La
Cyperus laevis		BW							KC		An											SH			
Cyperus polystachyos		BW			Lo			Be	KC		An											SH	HB		La
Cyperus sanguinolentus																							HB		
Cyperus tetraphyllus															Cu										
Eleocharis gracilis							Mu						Gn												
Eleocharis minuta																									La
Eleocharis sphacelata		BW											Gn							Ma					La
Fimbristylis dichotoma								Be			An													Wo	
Gahnia aspera		BW				Mm	Mu	Be	KC	Ba															
Gahnia clarkei	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd								SH			
Gahnia erythrocarpa		BW	Li		Lo		Mu	Be	KC	Ba		Ka	Gn	Gd						Ma					
Gahnia melanocarpa	Bd	BW						Be	KC	Ba		Ka													
Gahnia microstachya								Be	KC																
Gahnia radula		BW																							
Gahnia sieberiana		BW				Mm	Mu	Be	KC			Ka	Gn	Gd	Cu			Da	LC			SH			La
Gymnoschoenus sphaerocephalus		BW							KC																La
Isolepis cernua																									La
Isolepis inundata		BW					Mu	Be				Ka		Gd					LC			SH	HB		La
Isolepis nodosa	Bd	BW	Li		Lo	Mm	Mu		KC	Ba	An		Gn	Gd					LC			SH	HB		La
Lepidosperma concavum		BW			Lo	Mm	Mu		KC	Ba		Ka										SH			La
Lepidosperma elatius		BW																							
Lepidosperma filiforme		BW					Mu	Be	KC				Gn	Gd						Ma		SH			La
Lepidosperma forsythii																									La
Lepidosperma laterale	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	
Lepidosperma limicola		BW							KC									Da							
Lepidosperma neesii		BW					Mu					Ka	Gn	Gd						Ma		SH			La
Lepidosperma urophorum		BW																							
Lepidosperma viscidum	Bd	BW					Mu	Be	KC				Gn	Gd						Ma		SH			
Ptilothrix deusta	Bd	BW					Mu	Be	KC		An		Gn	Gd		PH		Da	LC	Ma		SH			La
Schoenoplectus validus		BW											Gn						LC				HB		
Schoenus apogon					Lo						An		Gn						LC			SH	HB		La
Schoenus brevifolius	Bd	BW						Be	KC			Ka	Gn	Gd					LC	Ma		SH			La
Schoenus ericetorum	Bd	BW					Mu							Gd				Da	LC	Ma					La
Schoenus imberbis		BW	Li	Sp	Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma		SH			

Schoenus lepidosperma		BW						Be	KC													
Schoenus maschalinus								Be												SH		
Schoenus melanostachys	Bd	BW	Li			Mm	Mu	Be		Ba	An	Ka	Gn	Gd		Da	LC	Ma	Wa		Wo	
Schoenus moorei														Gd				Ma				
Schoenus nitens																						La
Schoenus paludosus		BW					Mu	Be					Gn	Gd						SH		La
Schoenus turbinatus		BW				Mm		Be														
Schoenus villosus		BW						Be														
Tetraria capillaris		BW																		SH		
Tricostularia pauciflora		BW							KC				Gn							SH		La
Dioscoreaceae																						
Dioscorea transversa	Bd	BW							KC													
Eriocaulaceae																						
Eriocaulon scariosum																						La
Haemodoraceae																						
Haemodorum corymbosum		BW					Mu	Be	KC				Gn	Gd				Ma				La
Haemodorum planifolium	Bd	BW					Mu	Be	KC		An	Ka		Gd	PH		LC	Ma		SH		
Hydrocharitaceae																						
Ottelia ovalifolia																	LC					La
Hypoxidaceae																						
Hypoxis hygrometrica																	LC					
Iridaceae																						
Libertia paniculata	Bd	BW																				
Patersonia fragilis		BW						Be												SH		La
Patersonia glabrata	Bd	BW		Sp	Lo		Mu	Be	KC	Ba		Ka	Gn	Gd	PH	Da	LC	Ma		SH		La
Patersonia longifolia		BW				Mm	Mu	Be													Wo	
Patersonia sericea	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	PH	Da	LC	Ma		SH		
Juncaceae																						
Juncus continuus	Bd				Lo		Mu	Be			An	Ka	Gn	Gd				Ma		SH		
Juncus kraussii																						
subsp. *australiensis*	Bd	BW			Lo	Mm	Mu	Be	KC	Ba			Gn	Gd			LC				HB	La

Botanical name	**Bd**	**BW**	**Li**	**Sp**	**Lo**	**Ma**	**Mu**	**Be**	**KC**	**Ba**	**An**	**Ka**	**Gn**	**Gd**	**Cu**	**PH**	**DH**	**Da**	**LC**	**Ma**	**Wa**	**SH**	**HB**	**Wo**	**La**
Juncus pallidus																						SH			La
Juncus planifolius	Bd	BW					Mu	Be	KC			Ka							LC	Ma		SH			La
Juncus prismatocarpus		BW						Be					Gn							Ma		SH			
Juncus subsecundus								Be																	
Juncus usitatus		BW				Mm	Mu	Be	KC	Ba												SH	HB		La
Juncaginaceae																									
Triglochin procerum		BW											Gn									SH	HB		
Triglochin striatum	Bd	BW						Be						Gd					LC				HB	Wo	La
Lemnaceae																									
Spirodela punctata						Mm																			
Lomandraceae																									
Lomandra brevis		BW						Be					Gn												
Lomandra confertifolia	Bd	BW		Sp	Lo		Mu	Be	KC																
Lomandra cylindrica		BW					Mu	Be	KC			Ka		Gd				Da	LC						
Lomandra filiformis	Bd	BW	Li		Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu			Da	LC	Ma	Wa	SH		Wo	La
Lomandra fluviatilis						Mm		Be					Gn	Gd											
Lomandra glauca	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH		Da	LC	Ma		SH	HB		La
Lomandra gracilis				Sp	Lo		Mu	Be				Ka	Gn	Gd	Cu			Da	LC						
Lomandra longifolia	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Lomandra micrantha								Be																	
Lomandra multiflora	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka		Gd	Cu	PH			LC	Ma	Wa				La
Lomandra obliqua	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma	Wa	SH		Wo	La
Luzuriaceae (Philesiaceae)																									
Eustrephus latifolius	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC			SH	HB	Wo	La
Geitonoplesium cymosum	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu				LC			SH			La
Orchidaceae																									
Acianthus caudatus																									
var. caudatus		BW				Mm		Be				Ka	Gn			PH				Ma					
Acianthus exsertus						Mm		Be				Ka	Gn		Cu	PH			LC						
Acianthus fornicatus		BW				Mm	Mu	Be				Ka	Gn			PH						SH			La
Arthrochilus proxilus											An	Ka													
Bulbophyllum crassulifolium		BW																							

Bulbophyllum exiguum		BW				Mm			KC																
Caladenia caerulea						Mm							Gn			PH				Ma					
Caladenia carnea var. carnea		BW		Sp		Mm		Be			An	Ka	Gn			PH			LC			SH			
Caladenia catenata (C. alba)		BW				Mm	Mu	Be	KC		An		Gn	Gd	Cu	PH	DH					SH			
Caladenia deformis						Mm																			
Caladenia testacea						Mm		Be																	
Caleana major	Bd	BW				Mm			KC			Ka	Gn	Gd		PH									La
Calochilus campestris		BW				Mm					An	Ka	Gn			PH		Da	LC			SH	HB		
Calochilus paludosus		BW				Mm							Gn												La
Calochilus robertsonii			Li			Mm							Gn	Gd				Da							La
Chiloglottis diphylla													Gn												
Chiloglottis reflexa						Mm		Be			An	Ka	Gn			PH								Wo	
Chiloglottis trapeziformis											An		Gn									SH			
Corybas aconitoflorus						Mm						Ka	Gn			PH									
Corybas pruinosus															Cu	PH									
Corybas unguiculatus													Gn												
Cryptostylis erecta	Bd	BW	Li			Mm		Be	KC		An	Ka	Gn	Gd		PH			LC		Wa	SH			La
Cryptostylis subulata						Mm	Mu	Be	KC	Ba		Ka	Gn	Gd		PH			LC			SH			
Cymbidium suave	Bd	BW			Lo	Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC						
Cyrtostylis reniformis		BW							KC																
Dendrobium aemulum		BW										Ka													
Dendrobium linguiforme	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba		Ka	Gn	Gd		PH						SH			
Dendrobium speciosum	Bd	BW	Li			Mm	Mu	Be	KC			Ka	Gn	Gd		PH						SH			
Dendrobium striolatum									KC																
Dendrobium teretifolium						Mm																			
Dipodium punctatum	Bd	BW	Li			Mm	Mu	Be	KC		An	Ka	Gn	Gd	Cu	PH						SH			
Dipodium variegatum													Gn	Gd											
Diuris aurea	Bd	BW				Mm			KC		An		Gn			PH		Da	LC						
Diuris brevifolia																						SH			
Diuris sulphurea						Mm																			
Eriochilus cucullatus		BW				Mm							Gn												
Galeola cassythoides																						SH			
Gastrodia sesamoides		BW						Be				Ka										SH			
Genoplesium baueri						Mm							Gn			PH									
Genoplesium fimbriatum											An		Gn												
Genoplesium pumilum													Gn												
Glossodia major		BW				Mm							Gn			PH									
Glossodia minor		BW				Mm	Mu	Be	KC				Gn	Gd		PH			LC	Ma					

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Liparis reflexa	Bd	BW			Lo	Mm	Mu	Be	KC			Ka	Gn	Gd											
Lyperanthus nigricans		BW				Mm																			
Lyperanthus suaveolens		BW				Mm	Mu						Gn					Da							La
Microtis parviflora											An		Gn												
Microtis rara													Gn												
Microtis unifolia		BW				Mm		Be				Ka	Gn					Da							La
Orthoceras strictum						Mm			KC				Gn									SH			
Plectorrhiza tridentata		BW																							
Prasophyllum aureoviride		BW																							
Prasophyllum australe																PH									
Prasophyllum elatum		BW				Mm	Mu		KC				Gn			PH			LC	Ma					
Prasophyllum fimbriatum		BW												Gd		PH									
Prasophyllum morrissii		BW				Mm																			
Prasophyllum ruppii var. *ruppii*																PH									
Prasophyllum striatum								Be					Gn												
Pterostylis acuminata						Mm		Be			An	Ka	Gn			PH									La
Pterostylis baptistii													Gn												
Pterostylis coccinea																			LC						
Pterostylis concinna													Gn									SH			
Pterostylis curta		BW				Mm				Ba			Gn									SH			
Pterostylis daintreana						Mm							Gn												
Pterostylis grandiflora												Ka	Gn			PH									
Pterostylis longifolia		BW						Be				Ka	Gn	Gd		PH									
Pterostylis nutans		BW		Sp					KC		An	Ka	Gn			PH					Wa	SH			
Pterostylis obtusa						Mm																			
Pterostylis ophioglossa			Li																						
Pterostylis parviflora						Mm										PH									
Pterostylis pedunculata		BW											Gn		Cu										
Rimacola elliptica		BW											Gn	Gd					LC	Ma					
Sarcochilus australis						Mm										PH									
Spiranthes sinensis																									
subsp. *australis*		BW						Be					Gn												
Thelymitra carnea													Gn												
Thelymitra ixioides var. *ixioides*		BW		Sp		Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH			LC			SH			
Thelymitra media									KC							PH									
Thelymitra nuda													Gn												
Thelymitra pauciflora						Mm							Gn												La
Thelymitra rubra var. *rubra*																PH									

Philydraceae																									
Philydrum lanuginosum		BW						Be	KC				Gn											Wo	
Phormiaceae (Liliaceae)																									
Blandfordia nobilis								Be	KC			Ka	Gn	Gd		PH				Ma		SH			La
Dianella caerulea var. *caerulea*	Bd	BW	Li		Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd		PH	DH	Da	LC	Ma	Wa	SH	HB		La
Dianella caerulea var. *producta*						Mm				Ba			Gn									SH		Wo	
Dianella longifolia var. *longifolia*		BW				Mm	Mu	Be															HB		
Dianella prunina						Mm							Gn	Gd					LC						
Dianella revoluta		BW	Li	Sp	Lo	Mm	Mu	Be	KC					Gd	Cu	PH		Da	LC	Ma	Wa	SH	HB	Wo	La
Stypandra glauca	Bd					Mm			KC																
Thelionema caespitosum																PH			LC	Ma		SH			
Thelionema umbellatum	Bd	BW							KC					Gd								SH			La
Poaceae																									
Agrostis aemula																							HB		
Agrostis avenacea		BW										Ka	Gn										HB		La
Agrostis billardieri																									La
Ancistrachne maidenii								Be																	
Anisopogon avenaceus	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn	Gd					LC	Ma		SH			
Aristida benthamii var. *spinulifera*		BW			Lo			Be																	
Aristida calycina var. *calycina*							Mu																		
Aristida ramosa var. *ramosa*																			LC				HB	Wo	La
Aristida vagans		BW		Sp	Lo			Be	KC		An	Ka	Gn					Da	LC		Wa	SH	HB	Wo	
Aristida warburgii		BW										Ka											HB	Wo	La
Austrofestuca littoralis	Bd																								La
Chionochloa pallida	Bd																								
Cymbopogon refractus		BW		Sp	Lo			Be	KC		An	Ka	Gn										HB	Wo	La
Cynodon dactylon		BW					Mu	Be														SH	HB		La
Danthonia linkii var. *linkii*								Be															HB		
Danthonia longifolia						Mm						Ka										SH			
Danthonia pilosa var. *pilosa*	Bd																								
Danthonia setacea																				Ma			HB		
Danthonia tenuior							Mu	Be	KC		An	Ka	Gn	Gd			DH	Da		Ma		SH	HB	Wo	La
Deyeuxia decipiens												Ka						Da		Ma					
Deyeuxia quadriseta	Bd											Ka													

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Dichelachne crinita						Mm														Ma		SH	HB		La
Dichelachne micrantha		BW		Sp		Mm	Mu	Be	KC		An	Ka					DH	Da	LC	Ma		SH	HB		La
Dichelachne rara		BW						Be				Ka			Cu		DH	Da						Wo	
Digitaria brownii								Be																	
Digitaria didactyla	Bd												Gn									SH			La
Digitaria diffusa								Be																	
Digitaria parviflora	Bd	BW			Lo		Mu	Be	KC		An	Ka	Gn		Cu							SH		Wo	
Digitaria ramularis								Be																	
Echinopogon caespitosus	Bd	BW			Lo	Mm	Mu	Be			An	Ka	Gn	Gd			DH		LC		Wa	SH	HB	Wo	
Echinopogon ovatus							Mu	Be	KC								DH				Wa		HB		
Elymus scaber var. *scaber*																							HB		
Entolasia marginata	Bd	BW					Mu	Be	KC		An	Ka	Gn	Gd							Wa	SH	HB		
Entolasia stricta	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu			Da	LC	Ma	Wa	SH	HB		La
Eragrostis benthamii				Sp				Be				Ka											HB		
Eragrostis brownii	Bd	BW			Lo	Mm	Mu	Be	KC		An	Ka	Gn					Da		Ma		SH	HB	Wo	La
Eragrostis leptostachya					Lo		Mu	Be															HB		
Hemarthria uncinata var. *uncinata*	Bd	BW																				SH			La
Imperata cylindrica var. *major*	Bd	BW		Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Isachne globosa													Gn												
Microlaena stipoides var. *stipoides*		BW			Lo		Mu	Be			An	Ka	Gn	Gd	Cu		DH	Da	LC	Ma	Wa		HB	Wo	La
Oplismenus aemulus		BW				Mm		Be			An				Cu		DH	Da				SH			
Oplismenus imbecillis	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn		Cu			Da			Wa	SH			
Panicum effusum											An														
Panicum obseptum								Be			An														
Panicum simile	Bd	BW			Lo		Mu	Be	KC		An	Ka	Gn				DH		LC		Wa	SH	HB	Wo	La
Paspalidium albovillosum												Ka													
Paspalidium aversum																							HB		
Paspalidium distans	Bd	BW			Lo						An	Ka										SH			La
Paspalum distichum (*P. paspalodes*)																							HB		
Paspalum orbiculare												Ka													
Paspalum vaginatum (*P. distichum*)														Gd											
Phragmites australis	Bd	BW	Li			Mm	Mu	Be	KC				Gn	Gd					LC				HB	Wo	La

Plinthanthesis paradoxa												Ka													La
Poa affinis	Bd	BW	Li			Mm	Mu	Be	KC		An	Ka		Gd								SH			
Poa labillardieri																							HB		
Poa poiformis	Bd								KC																La
Poa queenslandica																					Wa				
Poa sieberiana var. *sieberiana*																							HB		
Sacciolepis indica																						SH			
Spinifex sericeus	Bd		Li																						La
Sporobolus elongatus															Cu										
Sporobolus virginicus																									
var. *virginicus*				Sp	Lo	Mm	Mu	Be	KC				Gn	Gd					LC				HB		
Stipa mollis																									La
Stipa pubescens		BW			Lo		Mu	Be	KC		An	Ka									Wa		HB		
Stipa ramosissima								Be															HB		
Stipa rudis subsp. *rudis*	Bd																								
Tetrarrhena juncea		BW					Mu		KC			Ka		Gd											
Themeda australis	Bd	BW	Li		Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Zoysia macrantha									KC					Gd								SH	HB		La
Potamogetonaceae																									
Ruppia maritima																							HB		
Restionaceae																									
Empodisma minus		BW					Mu	Be	KC		An	Ka	Gn	Gd					LC	Ma		SH			La
Hypolaena fastigiata	Bd	BW						Be	KC				Gn							Ma		SH			La
Leptocarpus tenax		BW						Be	KC			Ka	Gn	Gd						Ma		SH			La
Lepyrodia anarthria							Mu																		
Lepyrodia scariosa	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd				Da	LC	Ma		SH		Wo	La
Restio complanatus		BW										Ka	Gn	Gd								SH			La
Restio dimorphus		BW							KC				Gn	Gd						Ma		SH			
Restio fastigiatus		BW						Be	KC			Ka	Gn	Gd						Ma		SH			
Restio gracilis		BW																							
Restio tetraphyllus	Bd	BW							KC				Gn							Ma		SH			La
Ripogonaceae (Smilacaceae)																									
Ripogonum album																PH									
Ripogonum fawcettianum	Bd																								

Botanical name	Bd	BW	Li	Sp	Lo	Ma	Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH	DH	Da	LC	Ma	Wa	SH	HB	Wo	La
Smilacaceae																									
Smilax australis	Bd	BW				Mm	Mu	Be	KC	Ba	An	Ka	Gn						LC				HB		
Smilax glyciphylla	Bd	BW	Li		Lo		Mu	Be	KC	Ba	An	Ka	Gn	Gd	Cu	PH		Da	LC	Ma		SH		Wo	La
Typhaceae																									
Typha domingensis																							HB		
Typha orientalis								Be	KC				Gn						LC			SH	HB		
Uvulariaceae (Liliaceae)																									
Schelhammera undulata	Bd	BW			Lo	Mm			KC	Ba	An	Ka	Gn						LC			SH			
Xanthorrhoeaceae																									
Xanthorrhoea arborea	Bd	BW	Li	Sp	Lo	Mm	Mu	Be	KC	Ba	An	Ka	Gn	Gd		PH			LC			SH			
Xanthorrhoea macronema	Bd	BW		Sp		Mm			KC																
Xanthorrhoea media	Bd					Mm	Mu	Be	KC			Ka	Gn	Gd		PH			LC	Ma	Wa	SH		Wo	
Xanthorrhoea minor													Gn		Cu						Wa	SH			
Xanthorrhoea resinifera (*X. resinosa*)		BW		Sp		Mm	Mu	Be	KC				Gn	Gd				Da		Ma		SH			La
Xyridaceae																									
Xyris complanata								Be																	
Xyris gracilis subsp. *gracilis*	Bd	BW		Sp	Lo			Be	KC				Gn	Gd								SH			La
Xyris gracillis subsp. *laxa*		BW		Sp					KC																
Xyris juncea								Be	KC																
Xyris operculata	Bd	BW		Sp		Mm	Mu		KC				Gn									SH			La

Discussion

Regional affinities

Sydney's Hawkesbury Sandstone vegetation is part of the world-renowned Sydney Basin sandstone flora. The flora represents probably the richest assemblage of xeromorphic species in eastern Australia and is a remnant of the xeromorphic assemblage that has spanned the continent in the past, especially in the south (Beadle 1981). Sandstone vegetation is part of Beadle's Eucalypt Woodlands and Forests on Soils of Low Fertility Chiefly on the Eastern Coastal Lowlands (Beadle 1981), and Coastal sandstone in particular of his *Eucalyptus gummifera–Eucalyptus racemosa–Eucalyptus sieberi* Alliance.

The forests on shale are part of Beadle's Tall Eucalyptus Forests of the Eastern Coastal Lowlands mostly on Soils of Higher Fertility, and generally attributable to his *Eucalyptus pilularis* Alliance, *Eucalyptus maculata* Alliance or *Eucalyptus saligna* Alliance.

The coastal sand dune remnants are probably the southern extremity of the north coastal Wallum country (and part of Beadle's *Banksia aemula* [=*B. serratifolia*] and related Alliances). Saltmarsh vegetation includes mixtures of tropical and temperate influences, while mangroves, with only two species in the Sydney area, reflect a decreasing species richness in southern Australia.

Historical changes

The vegetation map provides a picture of the distribution of vegetation at one point in the present time, and while it is obvious that these patterns have changed since 1788 as a result of clearing, it is not always appreciated that there has been considerable change in vegetation distribution as climate and geological patterns have changed over thousands and millions of years. Although our knowledge of these past conditions is still sketchy, we are beginning to see some of the patterns, at least of the more recent past. For example, during the last 1.8 million years (in the Quaternary Period) colder and warmer periods alternated (Chapman et al. 1982, Benson & Howell 1990a). Dune sands were blown inland from the coast where today's southern and eastern suburbs lie. About 20 000 years ago, during the coldest part of the last of the Pleistocene ice ages, the sea fell to its lowest level, 120–140 m below the present. As it rose again to reach its present level about 6 000 years ago, it drowned the coastal river valleys to form Broken Bay and Pittwater, Sydney Harbour, Botany Bay and Port Hacking, and swept up the offshore sands on to the modern beaches, sometimes damming smaller streams to form lagoons such as at Narrabeen and Dee Why.

Pollen and charcoal analyses of sediments from South Salvation Creek Swamp in Ku-ring-gai Chase National Park (Kodela & Dodson 1989) indicate that pollen influx has been dominated by local swamp species and dry sclerophyll heath and woodland taxa for the last 6 000 radiocarbon years, but that fluctuations in their abundances and/or distributions have occurred. These are likely to be the result of a combination of factors, including watertable fluctuations, seasonal drought, fire activity, interspecific competition, the natural changing patterns in species distributions and the impact of Aboriginal and European people. None of these recent vegetation changes could be ascribed directly to climatic shifts, though changes in swamp and terrestrial pollen taxa around 2000 B.P. may indicate a drier climate than the present.

The impact of the Aborigines

Aboriginal people have been associated with the Sydney area for many thousands of years. Favoured living places were along the shorelines and along the Hawkesbury–Nepean River flats (Kohen & Lampert 1987, Kohen & Downing 1992).

On the coast plentiful supplies of seafood were supplemented with fruits, nectar, roots and tubers from plants growing on the extensive sand dunes and swamps that stretched from Bondi to Botany Bay and in the shrubby woodland and open-forest of the rocky harbour foreshores and nearby sandstone country (Benson & Howell 1990a). Sandstone gullies with rainforest-type vegetation would have provided further food sources, together with rocky overhangs and caves suitable for shelters and work sites.

It is hard to tell whether Aboriginal people altered the natural distribution or abundance of any food species either deliberately by planting, or accidentally by leaving remains associated with camp sites, nor is there evidence for changes in species abundance due to over-exploitation. However, Aboriginal people affected the vegetation by their use of fire and there has been a considerable amount written on this (e.g. see Nicholson, 1981). Many accounts contain very generalised statements often making reference to Aboriginal fire usage in Central and Northern Australia. Such usage does not necessarily apply to Southern Australia and, as far as the Sydney area is concerned, only limited observations were recorded before the effects of European settlement quickly overwhelmed Aboriginal society.

Possibly the most important point is that the Aborigines are likely to have managed different types of country differently. For example, they are likely to have burnt the open grassy understorey of the typical Cumberland Plain vegetation of western Sydney fairly frequently, probably with creeping or low-intensity fires. Such fires would have stimulated green shoots and provided favourable conditions for grazing animals. They would also have stimulated flowering in tuberous herbs such as orchids, which would have made them conspicuous. It is likely that such fires burnt at low intensity, as the trees were well-spaced and there would be limited fuel build-up. Such fires would be easily stopped by geographical features such as creeks, or indeed tracks, resulting in a patchy mosaic of burnt areas.

On the sandstone areas, however, it is likely that there were fewer fires, but that they burnt at higher intensities. Because of the shrubby nature of the vegetation, there would probably have been less game, and Aboriginal movement would have been more restricted by the topography than on the open Cumberland Plain. It seems less likely that deliberate burning would have been carried out on a broadscale basis, and more likely to have been localised around campsites and travelling routes to keep them clear, as well as around small-scale hunting sites such as individual

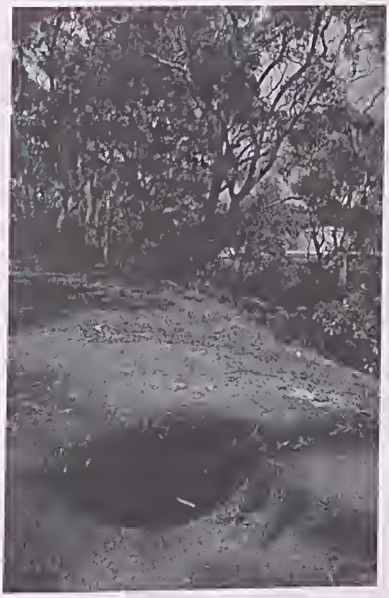


Figure 30. Signs of Aboriginal occupation, such as these axe-grinding grooves beside a rock pool, may still be found in bushland reserves within a few kilometres of the city centre.

trees. It is likely that hot summer fires would have been a feature of the sandstone areas, possibly on a 10–20 year cycle. On the sandstone the understorey is shrubby and very varied. Most species regenerate after fire, but some are killed, and it takes 3–10 years for recovery to reproductive maturity of most of these shrub species (Bradstock & Myerscough 1981, Benson 1985, Bradstock 1990). Clark & McLoughlin (1986) report similar findings for the Lane Cove valley catchment, where burning was likely to have been more frequent on the shale ridges (at 1–5 year intervals) than on the sandstone slopes (7–15 year intervals).

The impact of the Europeans

An idea of how the country around Sydney appeared to the British colonists comes through in this 1827 description by writer Peter Cunningham, not to be confused with Allan Cunningham, the botanist. 'In Cumberland, the land immediately bordering upon the coast is of a light, barren, sandy nature, thinly be sprinkled with stunted bushes; while from ten to fifteen miles interiorly, it consists of a poor clayey or ironstone soil, thickly covered with our usual evergreen forest timber and underwood. Beyond this commences a fine timbered country, perfectly clear of bush, through which you might, generally speaking, drive a gig in all directions, without any impediment in the shape of rocks, scrubs or close forest. This description of country commences immediately beyond Parramatta on one hand, and Liverpool on the other; stretching in length south easterly obliquely towards the sea, about forty miles and varying in breadth near twenty. The soil upon the immediate banks of the rivers is generally rich flooded alluvial, but in the forests partakes commonly of a poor clayey or ironstone nature, yet bearing tolerably crops, even without manure, at the outset'.

This extract clearly shows how the geology and its accompanying vegetation directed the pattern of settlement. The barren Hawkesbury Sandstone and aeolian sand deposits of the country around Port Jackson, particularly the present Eastern Suburbs, i.e. 'immediately bordering upon the coast', with its stunted sclerophyllous vegetation, was agriculturally useless to the settlers. 'Ten to fifteen miles interiorly' would have included country from Homebush and Bankstown, west to Parramatta and Liverpool which had Wianamatta Shale with ironstones and clay soil. This would have supported eucalypt open forests with shrubby understoreys including much Paperbark, *Melaleuca decora*. Beyond Liverpool and Parramatta is the 'fine timbered' Cumberland Plain, gently undulating to flat country with deep clay soils supporting an open grassy woodland community. The rich alluvial soils on the river banks are mentioned, but no reference is made of the tall open forest that this supported. Much of this forest, particularly on the Hawkesbury, had been cleared for agriculture by 1830.

From very early days some plant communitites were sought and cleared, while others were avoided. With the exception of small areas at Sydney (at Farm Cove) and at Rose Hill, the first intensively cultivated lands were the rich alluvial flats of the Hawkesbury–Nepean River at Windsor and Richmond. At the same time the grassy woodlands of the Cumberland Plain were beginning to be grazed. Sheep were the main grazing animals and were at first tended by shepherds until fencing made them redundant. The granting of land was followed by sporadic clearing of trees to encourage the growth of grass, then more extensive ring-barking or sapping. Extensive areas were often cleared of every tree. In 1844, for example, Mrs Meredith described how 'Homebush', halfway between Sydney and Parramatta, had been completely cleared of every tree for 1000 acres (Benson & Howell 1990a). Along the North Shore, and the northern suburbs from Epping to Hornsby, the tall open-forests of Blackbutt and Blue Gum were logged and then, because of the good soil and high rainfall, cleared to make way for dairy farms and orchards. In contrast, the shrubby forests and woodlands on the Hawkesbury Sandstone, because of their poor agricultural soils, remained largely undisturbed and were used only as sources of firewood, fence posts or small timber.

From the 1850s railway lines were built, radiating from Sydney. For engineering reasons these followed the most level routes. This was generally along the Wianamatta Shale country to the west and south, and later along the North Shore ridge to Hornsby. Suburbs followed the railways, and by the turn of the century extensive housing had spread from Sydney to Burwood in the west and to Hurstville in the south. Electric tramways made other areas accessible for housing, particularly in the harbourside Eastern suburbs, where the rows of stepped terrace houses which were built emphasize the steep nature of the original sandstone topography. Ferry services opened other harbourside sandstone sites to suburban development; for example Balmain, Mosman and the lower North Shore.

The North Shore railway, the car and the Sydney Harbour Bridge made the North Shore area increasingly accessible. Its remnant tall Blackbutts and Blue Gum trees, its milder climate, compared with the western suburbs of Sydney, and the adjacent natural bushland gullies along the rugged Lane Cove River valley and upper Middle Harbour have made this one of the most sought after of Sydney`s suburban areas. Particularly since the Second World War, bushland on Hawkesbury Sandstone has been increasingly cleared for suburban housing though there has been an increasing interest in retaining native vegetation as urban bushland. By contrast, and mainly because of the gentler topography of the country and lack of obviously colourful shrubs, bushland on the shale areas of western Sydney has been cleared for suburban development with little recognition given to any native plants that manage to survive.

Rare or endangered species

The occurrence of species in the major conservation areas (Table 4) gives a measure of the floristic richness of the map sheet area. For example, 566 native species and 82 exotic species have been recorded from Ku-ring-gai Chase National Park (Thomas & Benson 1985a). Seventy-eight significant plant species are listed for the Sydney map sheet area (Table 5), forty-one of which are listed as nationally rare or endangered species (Briggs & Leigh 1988) or of regional significance. Species listed are either rare, threatened or of botanical significance in terms of geographic distribution. The list contains species of varying rarity and conservation status: for example, *Allocasuarina portuensis* is a recently discovered species restricted to Sydney Harbour National Park; a number of the *Darwinia* species have locally restricted distributions; and *Tetratheca juncea* originally occurred in the Carlton to Undercliff area but is now almost certainly extinct there (Payne 1993). *Lampranthus tegens*, possibly originating in South Africa but not able to be equated with any known African species, therefore needs protection of populations here (Benson & McDougall 1993). Other species are restricted to fragments of almost totally cleared vegetation types, e.g. Eastern Suburbs *Banksia* scrub. Vegetation surveys for major conservation reserves generally include specific lists for those areas (e.g. Thomas & Benson 1985a, b).

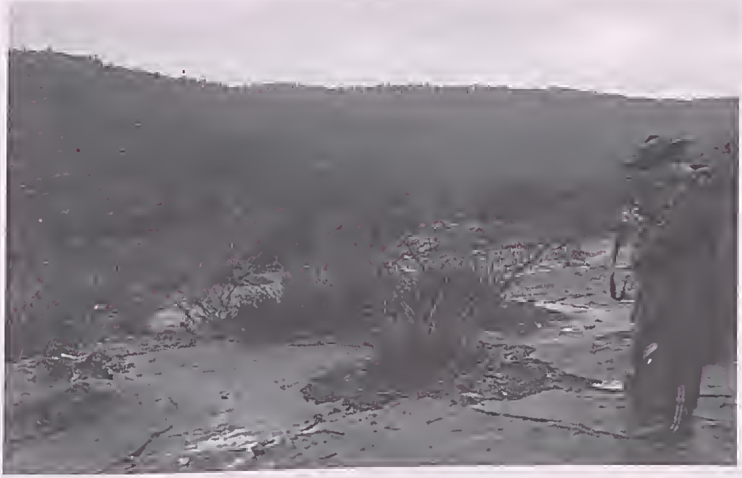


Figure 31. The rare plant *Kunzea rupestris* is confined to a few rock platforms in north-western Sydney.

Table 5. Species of particular conservation significance within the Sydney 1:100 000 map sheet area

Species listed here are either rare or threatened, or of botanical significance in terms of geographic distribution or localised populations disjunct from other occurrences. Localities refer to Sydney map sheet occurrences. Conservation codings are from Briggs & Leigh (1988) with current ROTAP updatings. Nth = northern, Sth = southern, NP = National Park, NR = Nature Reserve

Family/species	Habitat/locality	Significance
Aizoaceae		
Lampranthus tegens	Saltmarsh, Homebush Bay	Only known wild populations of this species (Benson & McDougall 1993)
Apiaceae		
Lilaeopsis polyantha	Dee Why Lagoon	Local population
Platysace clelandii	Muogamarra NR, Marramarra Creek	2RCa
Platysace stephensonii	Ridgetop, Deep Creek	3RC-
Araliaceae		
Astrotricha crassifolia	Woy Woy, Warrah	Local endemic
Casuarinaceae		
Allocasuarina diminuta	Kingsford	Local disjunct population
Allocasuarina nana	Ridgetop, Deep Creek	Local disjunct population
Allocasuarina portuensis	Nielsen Park	2ECit, local endemic
Chenopodiaceae		
Halosarcia pergranulata subsp. *pergranulata*	Saltmarsh, Homebush Bay	Local disjunct population
Convolvulaceae		
Wilsonia backhousei	Saltmarsh, Homebush Bay	Local population, rare
Dilleniaceae		
Hibbertia nitida	Thornleigh, Garigal NP, Oatley	2RC-
Hibbertia virgata	Sand dunes, Eastern Suburbs	Nth-limit
Epacridaceae		
Epacris purpurascens var. *purpurascens*	Gosford–Sydney	2KC-, local endemic
Euphorbiaceae		
Bertya brownii	Katandra, Mona Vale	2RC-, Sth-limit
Pseudanthus pimeleoides	Open-forest, ridges, Terrey Hills	Local populations, rare
Fabaceae		
Acacia bynoeana	Pennant Hills, Northbridge, Mosman, Cooks River	3VC-, probably locally extinct
Acacia quadrilateralis	Malabar	Sth-limit, locally extinct
Acacia pubescens	Bankstown, Belmore, Flemington, Rookwood	2VCa

Daviesia umbellulata	Pittwater	Rare local population
Mirbelia speciosa	Marramarra, Ku-ring-gai	Uncommon
Pultenaea dentata	Coastal heath, La Perouse Nth-limit	Local disjunct population
Pultenaea hispidula	Belrose, Allambie, shale/lateritic soils	Local populations, uncommon .
Pultenaea pedunculata	Yennora	Local population, probably extinct in NSW
Pultenaea viscosa	Open-forest, Pennant Hills Park	Rare
Goodeniaceae		
Dampiera scottiana	Marramarra	Local disjunct population Nth-limit
Haloragaceae		
Gonocarpus salsoloides	North Head, Rose Bay, La Perouse	3RCa, local populations
Haloragodendron lucasii	Barra brui	2ECi, local endemic, rare
Lamiaceae		
Prostanthera denticulata	Lower hillslopes, Ku-ring-gai Chase NP Garigal NP	Local endemic, uncommon
Loganiaceae		
Logania pusilla	Muogamarra, Katandra	Local populations, rare
Myrtaceae		
Angophora crassifolia	Ridgetop, Deep Creek Frenchs Forest	2RCa, local endemic
Darwinia biflora	Hawkesbury River–Port Jackson	2VCa, local endemic
Darwinia diminuta	Terrey Hills–Manly–Sutherland–Bulli	3RCi, local endemic
Darwinia leptantha	Coastal heath, North Head–Cronulla	Local disjunct population
Darwinia peduncularis	Hornsby–Hawkesbury River	3RCi, local disjunct populations
Darwinia procera	Gosford–Manly	2RCa, local endemic
Eucalyptus acmenoides	Wianamatta Shale, Galston, Ryde	Rare, Sth-limit
Eucalyptus camfieldii	North Head, Killara, Hornsby, Ku-ring-gai Chase NP, Dural	2VCi, local populations
Eucalyptus capitellata	Residual clay cappings Brisbane Water NP St Ives, Allambie Heights	Local populations, now uncommon
Eucalyptus luehmanniana	Heath on sandstone, northern Sydney	2RCa, local populations
Eucalyptus robusta	Swamp-forest, Gosford, Pittwater	Local populations, now rare

Eucalyptus scias	Pittwater–Warringah	Local populations, rare
Kunzea rupestris	Canoelands, Ku-ring-gai Chase NP	2VCi, local endemic
Leptospermum deanei	Marramarra Creek, Pennant Hills Park, Middle Harbour Creek	2V, local endemic
Melaleuca deanei	Dry scrub, Hornsby, Pennant Hills Park, Lane Cove, Garigal NP, Earlwood	3RC-, local populations
Micromyrtus blakelyi	Rocky ridges, Muogamarra NR, Marramarra NP	2VCi-, local endemic
Syzygium paniculatum	Balgowlah, Wolli Creek	3VCi, local populations
Proteaceae		
Banksia aemula	Pleistocene sand, Bouddi, North Head, La Perouse	Local disjunct populations, southern limit
Grevillea caleyi	Terrey Hills to Belrose	2ECi, local endemic
Grevillea linearifolia (narrow-leaved form)	Marramarra, Arcadia	Local form
Hakea bakeriana	Marramarra	Rare, Sth-limit
Persoonia hirsuta	Deep Creek	3KCi
Persoonia mollis subsp. *maxima*	Hornsby	2E, local endemic subspecies
Symphionema paludosum	Brisbane Water NP, Belrose	Local populations, uncommon
Rutaceae		
Asterolasia elegans	Moist forest, north of Maroota	2ECi, restricted local endemic
Boronia floribunda	Open-forest, Pennant Hills Turramurra, Garigal NP	Uncommon
Boronia fraseri	Ku-ring-gai Chase NP Marramarra NP	2RCa, local endemic
Boronia serrulata	Brisbane Water, Arcadia, Ku-ring-gai Chase NP	2RC-, rare, once common in northern Sydney
Zieria involucrata	Marramarra Creek	2RCa
Sterculiaceae		
Lasiopetalum joyceae	Ku-ring-gai Chase NP, Arcadia	2RC-, local endemic
Lasiopetalum macrophyllum	Marramarra, Ku-ring-gai	Uncommon
Rulingia hermaniifolia	Coastal heath, Bouddi–Cronulla	3RCa, Nth-limit, rare
Tremandraceae		
Tetratheca glandulosa	Wisemans Ferry–Port Jackson	2VC-, local populations, Sth-limit
Tetratheca juncea	Sandstone, Carlton–Tempe, Rookwood	3VCi, Sth-limit, locally extinct
Tetratheca neglecta	Sandstone, Arncliffe–Como	3RC-, rare, Nth-limit

Monocotyledons		
Anthericaceae		
Alania endlicheri	Moist cliff-faces, Arcadia	Local population
Araceae		
Typhonium eliosurum	Patonga Creek	3RC-, rare
Cyperaceae		
Baumea muelleri	Damp heath, Katandra, Oxford Falls	Sth-limit
Gahnia filum	Saltmarsh, Georges River	Nth-limit
Lomandraceae		
Lomandra brevis	Ku-ring-gai Chase NP, Deep Creek, Kogarah	2RC-
Lomandra fluviatilis	Marramarra Creek, Deep Creek	3RCa
Orchidaceae		
Arthrochilus prolixus	Avalon	Rare local population, southern limit
Caladenia tesselata	Berowra, Castlecrag, Tempe, Penshurst	3V, probably locally extinct
Corybas undulatus	St Ives, Frenchs Forest	3KC-, probably locally extinct
Cryptostylis hunteriana	Ku-ring-gai Chase NP	3VC-
Genoplesium baueri	Ku-ring-gai Chase NP, Deep Creek	3RC-
Sarcochilus australis	Marramarra	Uncommon
Poaceae		
Ancistrachne maidenii	Berowra Creek	2KC-, local endemic
Deyeuxia appressa	Saltpan Creek, Killara	2E, local endemic

Conservation of vegetation

Despite the impact of the city of Sydney and its suburban sprawl, a surprising amount of natural vegetation has managed to survive. This includes large parklands on the edge of the suburban areas and many small patches within them. Survival has mainly been fortuitous, rather than planned. Because of the extent of the Hawkesbury Sandstone with its very limited agricultural capacity, many areas have remained uncleared, much as Crown land during the agricultural expansion of the nineteeth century.

The obvious attractiveness of the Hawkesbury Sandstone landscape scenery and flora and the relative uselessness of the land for farming led to pressure from the early and farsighted 'preservationists', in particular Eccleston du Faur, for the establishment of Ku-ring-gai Chase in 1892, Sydney's second major conservation area (following National Park (later Royal N.P) dedicated in 1879 for similar reasons). Lane Cove River National Park followed. Muogamarra Nature Reserve began as a private 'nature reserve' and was enlarged with Crown land. Marramarra National Park and Davidson State Recreation Area (now part of Garigal N.P.) were formed out of the considerable reserves of Crown land still available up to the 1980s. Similarly, the Commonwealth Government's holding of land on Sydney Harbour and Botany Bay for defence purposes inadvertently preserved much land that could have been built over but which was to become the nucleus for Sydney Harbour National Park. The rugged nature of the Hawkesbury sandstone landscape also resulted in small parks and reserves often being left in housing subdivisions in inaccessible sites.

Elsewhere the native vegetation disappeared. On the Wianamatta Shale soils woodland was cleared for grazing and agriculture, and then for suburban housing. Similar suburban development replaced the vegetation on the Eastern Suburbs sand dunes. Even with the far-sighted setting aside of Centennial Park, only a trifling patch of the original *Banksia* scrub survives, in the Bird Sanctuary. More extensive remnants survive at Long Bay and La Perouse, again largely because of Commonwealth Government control for military purposes. It is hoped these bushland areas will eventually be formally conserved. Reclamation programs to turn the mangrove and estuarine vegetation of the Parramatta and Georges Rivers into playing fields have been promoted for most of this century and have only just been stopped in time, leaving some remnants such as at Homebush Bay. Changes such as the cessation of landfill of mangroves have come about because of increased public awareness of the value of natural vegetation and the need to maintain biological diversity. This concern is now also directed towards the management and maintenance of reserved areas. There are two particularly pressing problems — exotic weed invasion and fire.

The invasion of urban bushland by exotic weed species was specifically highlighted by Adamson and Buchanan (1974), though the spread of weeds along watercourses into undisturbed areas is mentioned by Pidgeon (1938). *Ligustrum sinense* and *Ligustrum lucidum* (Privet species), *Lantana camara*, *Tradescantia albiflora* and a host of other weed species of garden escape origin, are able to invade normally resistant natural bushland where there has been some form of disturbance, particularly involving the addition of soil nutrients (Clements 1983). Characteristically these weeds form extensive thickets along creeks and drainage lines. The best method of restricting weed proliferation is to stop nutrients entering the soil from stormwater run-off and from creek floodwaters, and ways of reducing this have been suggested by Bliss et al. (1983). A method of hand-weeding was originated by Joan and Eileen Bradley in Mosman bushland (Bradley & Bradley 1966–74, Bradley 1971) and has been successfully developed as part of a bushland management strategy by the National Trust and other groups (National Trust 1991 — this also includes a list of its bushland surveys, Buchanan 1989, Bradley 1988).

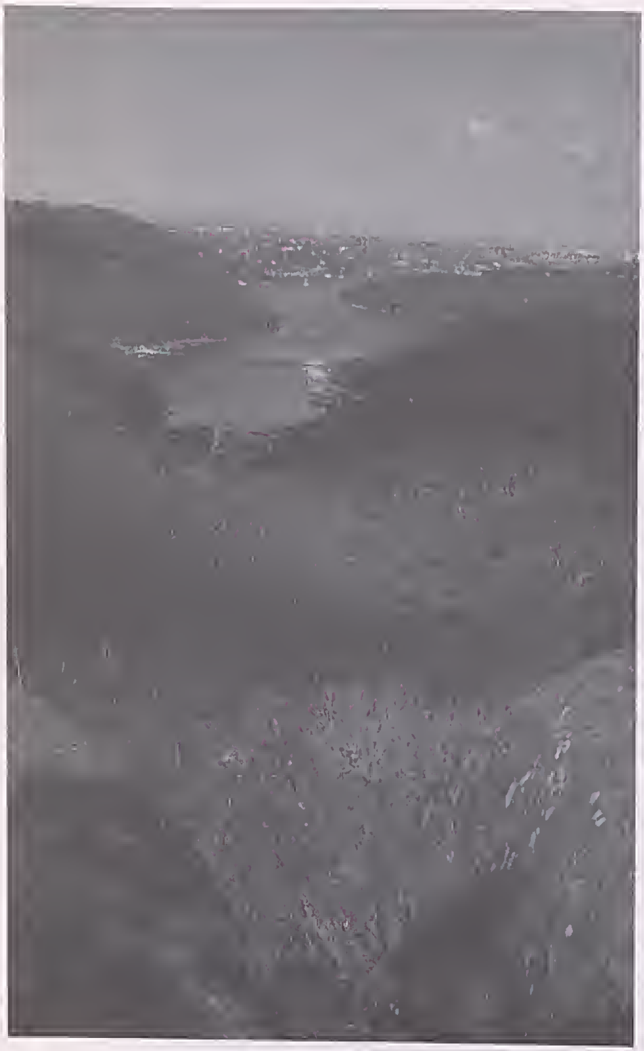
The fragmentation of bushland in suburban areas and the potential fire hazard has led to the increased use of regular controlled burning for fuel reduction in some areas and decreased use of fire in others (Clark & McLoughlin 1986). Most of Sydney's native vegetation is adapted to fire, but at different frequencies for the different types and communities, because of aspect and topography. Although some species may regenerate well after fire, other species may be destroyed by frequent fire which does not allow adequate time intervals for the build-up of seed banks (Benson 1985, Bradstock 1990). This means that the length of time between fires needed for species survival varies from community to community. Fire intensity is also an important factor; low intensity burns may not stimulate adequate native seedling regeneration while allowing weed growth (Bradley 1971). Different fire management approaches are therefore needed for different communities.

In the absence of fire, there is a tendency for species of wetter sites, such as *Pittosporum undulatum*, to predominate at the expense of those requiring fire for germination, such as members of the Fabaceae (Auld & O'Connell 1991). To achieve a balance between these factors, a long-term management program will need information based on observations on the behaviour of a wide range of species, together with a range of management options including the use of fire and selective land clearing.

The future

Sydney's bushland setting provides a major contribution to the individual character of the city. But bushland is still threatened by direct destruction for urban and recreational development, and indirectly by nutrient run-off, weed invasion, and shortsighted management. Bushland is particularly vulnerable to the 'tyranny of small decisions'. In the face of this, much of the responsibility for ensuring careful management of urban bushland has fallen to local residents and organisations keen to maintain the local identity of bushland areas. Public awareness of the need for protection and professional management of bushland is increasing, and recognition of its value needs to be supported by government policies and planning provisions at federal, state and local levels.

Such management involves the employment of professionally trained staff and the development of appropriate bushland and catchment management techniques. Management will often be constrained by lack of knowledge on the responses of plant species and vegetation. Additional supporting research is needed, as researchers are currently faced with a wide array of problems needing investigation. In the meantime, decisions will need to be made in terms of the reversibility of actions and keeping future options open. Successful conservation aims to maintain current levels of biological diversity, and this must be seen as a guiding principle.



Figures 32 & 33. Bushland slopes and gullies near urban areas provide a unique opportunity for Sydneysiders to grow up experiencing the natural world within the context of a city.

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j. Glebe Gully, Randwick, Sydney, (1977),
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l. Katandra Sanctuary, Mona Vale, Sydney, (1975–79, 1988),
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Ecology of Sydney plant species

Part 2: Dicotyledon families Asteraceae to Buddlejaceae

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Abstract

Benson, Doug and McDougall, Lyn (National Herbarium of New South Wales, Royal Botanic Gardens Sydney, Australia 2000) 1994. Ecology of Sydney plant species: Part 2: Dicotyledon families Asteraceae to Buddlejaceae. Cunninghamia 3(4) 789–995. Ecological data in tabular form is provided on 355 plant species, 187 native and 168 exotics, mostly naturalised, occurring in the Sydney region, defined by the Central Coast and Central Tablelands botanical subdivisions of New South Wales (approximately bounded by Lake Macquarie, Orange, Crookwell and Nowra). Families are Asteraceae, Avicenniaceae, Balsaminaceae, Basellaceae, Baueraceae, Berberidaceae, Bignoniaceae, Boraginaceae, Brassicaceae, Buddlejaceae.

Data is derived from herbarium collections, literature and field observations. It is hoped that the many, often alarming, gaps in the information available will stimulate much-needed research into the ecology of more of the species. Information is provided so far as available to us for each plant species in the following categories:

Life History: Growth form, vegetative spread, longevity, primary juvenile period (time from germination to fruiting), reproduction, flowering and fruiting times, fruit/seed type, dispersal, establishment and growth, fire response, interaction with other organisms.

Distribution: Status/origin (native/naturalised), botanical subregions, distribution in Sydney area, selected locations.

Habitat: Habitat, altitude, annual rainfall, typical local abundance, vegetation, substrate, exposure.

Conservation: Conservation status.

Introduction

The *Ecology of Sydney Plant Species* aims to provide ecological information on native and naturalised Sydney plants. Particular emphasis has been given to data that is relevant for ecologists and natural area managers, for people involved in bush regeneration, land rehabilitation and landscape design, for researchers in many fields and for a wide range of people who are interested in bushland and native plants. Species-specific information is also relevant to environmental impact assessment and to studies involving changes in drainage, water movement, wind exposure, nutrient conditions and fire regimes on plant species and plant communities. Information included covers growth form, flowering and fruiting times, longevity and maturity periods; pollination and seed dispersal data, distribution, habitat and plant community, as well as responses to fire and disturbance where available, and is largely complementary to the descriptive texts in taxonomic handbooks such as the *Flora of New South Wales* (Harden 1990–93).

Part 2 of the *Ecology of Sydney Plant Species* covers Dicotyledon families alphabetically from Asteraceae to Buddlejaceae. Families covered are Asteraceae, Avicenniaceae, Balsaminaceae, Basellaceae, Baueraceae, Berberidaceae, Bignoniaceae, Boraginaceae, Brassicaceae, Buddlejaceae. A total of 355 plant species are included, 187 native and 168 exotics, mostly naturalised. Species for which we have good ecological data include *Avicennia marina, Raphanus raphanistrum, Cirsium vulgare, Chrysanthemoides monilifera, Chondrilla juncea* and *Xanthium spinosum*. For the majority of species, the presentation of our current knowledge shows many, often alarming, gaps in the information available. It is hoped that making the situation better known will stimulate much-needed and wide ranging research into the ecology of many more of these species.

Methods

Part 2 follows the format used in *Part 1 — Ferns, fern allies, cycads, conifers and Dicotyledon families Acanthaceae to Asclepiadaceae* (Benson & McDougall 1993). The Sydney region is defined as the Central Coast and Central Tablelands botanical subdivisions (i.e. approximately bounded by Lake Macquarie, Orange, Crookwell and Nowra) (Figure 1). This is the area broadly covered by *Flora of the Sydney Region* (Carolin & Tindale 1993), with the exception that the Hunter Valley is not included here since it lies within the North Coast and Central Western Slopes subdivisions.

The Sydney region includes approximately 3500 plant species, both native and naturalised. To deal effectively with this number, the work has been divided into parts each of approximately 350 species based on plant families beginning with ferns, Cycads and Gymnosperms, and then Dicotyledon and Monocotyledon families. Within these groups, families, genera and species are arranged alphabetically:

Part 1:	Ferns, Fern allies, Cycads and Conifers Dicotyledon families Acanthaceae to Asclepiadaceae
Part 2:	Dicotyledon families Asteraceae to Buddlejaceae
Part 3:	Cabombaceae to Eupomatiaceae
Part 4:	Fabaceae
Part 5:	Flacourtiaceae to Myrsinaceae
Part 6:	Myrtaceae
Part 7:	Nyctaginaceae to Rubiaceae
Part 8:	Rutaceae to Zygophyllaceae
Part 9:	Monocotyledon families
Part 10:	Monocotyledon families

For each species (and generally for subspecies) a data sheet is prepared incorporating life history, distribution and habitat data from specimens in the National Herbarium of New South Wales and this information is entered in a database. To this are added data from literature sources both published and unpublished. References have been cited as appropriate but for unreferenced data responsibility has been assumed by the authors. A provisional compilation sheet with the available information is then prepared and distributed to interested persons for comments and additions/alterations. This compilation is then published in parts in *Cunninghamia*, with the subsequent long-term aim of producing a book at the completion of the ten parts. This will allow the incorporation of new and additional material.

Information categories

For each species or subspecies, information is presented under headings relating to different life-history aspects, each with further subdivisions. Emphasis has been given to understanding the species in its wild habitat. For this reason data on cultivation and artificial propagation, available in horticultural books, is generally not included. Likewise, information on weed control is not given. Otherwise, however, the categories are broadly interpreted and since an aim of the project is to stimulate further investigation, we welcome the addition of extra data on any other aspects of the plants' ecology.

Botanical nomenclature

Family/Genus/Species: Names currently recognised at the National Herbarium of New South Wales and mostly as used in *Flora of New South Wales*.

Common name: Names used in *Flora of New South Wales*.

Life history

Growth form: Brief description.
Source: *Flora of New South Wales*.

Vegetative spread: Indication of whether localised expansion or spread is possible from an individual by rhizome, stolon, rootsucker etc. Important in determining ability of species to colonise immediate local area. Does not include vegetative distance dispersal which is included under Establishment & Growth (diaspore).
Source: Flora descriptions, Herbarium specimens, field observations.

Longevity: Average potential life-span under natural conditions — range in years where possible, indefinite, where death is not a result of inherent growth e.g. continued rhizomatous growth. Longevity may be shorter in cultivation.
Source: Literature, authors' assessment from field observations.

Primary juvenile period: time taken from germination to produce first fruits or spores (Gill [1975] uses the term for the period from germination to flowering but

the period to fruit maturity is more significant ecologically). Secondary juvenile period is the time taken for an individual to recover to produce fruit after major damage e.g. from fire, but applicable only if the species regularly resprouts.
Source: Literature, field observations.

Reproduction: For Angiosperms, Reproduction separated into:

> **Flowers:** flower colour, flowering period — range of months and, where possible, peak month based on frequency of herbarium collections. Pollination vectors.
> **Fruit:** fruit shape and size, particularly with respect to potential dispersal agents. Maturation period. Seed size and number.
> **Source:** Herbarium specimens, field observations, *Flora of New South Wales*, literature.

Establishment and growth: Diaspore type (including vegetative), dispersal agent. Germination requirements: seedbank presence, dormancy, growth rates, seasonality, deciduousness etc. [notes on propagation in cultivation may be given where these imply similar behaviour under natural field conditions e.g. insights into seed germination inhibition].
Source: Literature, field observations.

Fire response: General response of mature plant to fire, in particular whether it generally resprouts or is killed (see also Gill 1981, Gill & Bradstock 1992). Seedling recruitment associated with fire is included under establishment and growth.
Source: Field observations, literature.

Interaction with other organisms: Symbiosis, predators, diseases etc.
Source: Mainly literature.

Distribution

Status/origin: native or naturalised, region of origin, source and date of introduction/ naturalisation
Source: *Flora of New South Wales*, literature.

Botanical subregions: occurrence of species in botanical subdivisions of N.S.W., other states and countries.
Source: National Herbarium of New South Wales.

Distribution in Sydney area: Main geographic regions occupied by species.
Source: Herbarium specimen records.

Selected locations: restricted to about 10 localities for each taxon reflecting natural geographical range of species in the Sydney area. Earliest collection dates are given for some species, particularly exotic species. Recent collection sites indicated where possible. Locality data must be interpreted carefully. The record may be based on an old specimen or observation record and the species may no longer be present at the site. However a knowledge of the original distribution may be important in showing up particular habitat requirements of the species.
Source: Herbarium specimen records.

Habitat

Specific data refers to Sydney area unless stated otherwise.

Habitat: Brief generalised description.
Source: Herbarium specimen records, field observations.

Altitude: Approximate altitudinal range (m +/- 100 m) occupied by the species.
Source: Herbarium specimen records.

Annual rainfall: Approximate annual rainfall range (mm +/- 100 mm) for sites occupied by the species.
Source: Bureau of Meteorology (1975, 1979).

Typical local abundance: Most frequent recordings (scale: dominant/frequent/occasional/rare).
Source: Herbarium specimen records.

Vegetation: Main structural type with typical associated species where available.
Source: Herbarium specimen records, field observations, literature.

Substrate: Geology, soil, moisture supply.
Soil nutrient rating scale: Very fertile (e.g. basalt soils)/fertile/infertile/very infertile (e.g. sands).
Soil water-table scale: permanently high/mostly high/mostly low/permanently low.
Soil salinity scale: Hypersaline/saline/brackish/fresh.
Source: Herbarium specimen records, field observations, literature.

Exposure:
Exposure scale: Exposed/indifferent/sheltered.
Shading scale: Deep shade/mid shade/light shade/no shade.
Source: Herbarium specimen records, field observations, literature.

Conservation

Conservation: National significance listing (Briggs & Leigh 1988), regional significance and adequacy of conservation within Sydney area where available.
Source: Herbarium records, field observations, literature.

General comments on Part 2

The majority of this part covers the family Asteraceae. There are 270 species of Asteraceae, 41% of which are exotic. Some of these are major agricultural weeds and it is these weed species, e.g. *Cirsium vulgare*, *Chondrilla juncea*, that are the best known ecologically. There has been virtually no serious ecological study of any of the native species. A few endangered species, e.g. *Olearia cordata*, have been the subject of Recovery Plans, but these are only based on general survey work with little intensive follow-up. Many of the Asteraceae are relatively inconspicuous or uncommon and tend to be overlooked. Little appears to be known on many of the shrubby Asteraceae, although many are well represented in the Sydney area in a range of habitats from rainforest to heath. Of the 51 NSW species of *Olearia*, 23 occur in the Sydney area, as well as 15 out of 45 *Brachycome* species and 9 out of 14 *Vittadinia* species. These species do not have conspicuous fire responses like Proteaceae and Myrtaceae, although this itself may be a valid reason for studying them. Many may be short-lived and important in colonising disturbed sites and may have potential for land rehabilitation projects. Yet we have little data in regard to dispersal, growth rates or colonising behaviour, pollination vectors and propagule dispersal mechanisms.

Similar comments apply to the other families in this Part. Longevity of species, apart from annuals, is rarely noted. Data on fire responses are available for common, conspicuous species but not for the smaller, less obvious species. The conservation status of many species is unknown. Collections from the early 1900s suggest that many Asteraceae appear to have been widespread in the Sydney area but are now much more restricted. Because they are not conspicuous their disappearance has not been noted, but species like *Cassinia uncata, Cassinia longifolia* and *Ozothamnus adnatus*, previously recorded in the Sydney suburban area, have not survived well in urban bush reserves, either because of more mobile populations or because they required the higher-nutrient soils that were subsequently cleared. For the many exotic weed species other than those of concern to agriculture, we have only limited knowledge of their current distributions and little idea of whether they are stable or becoming potential problems. Quite a number of species have only been recorded since the 1960s and may be spreading e.g. *Acanthospermum australe, Leontodon taraxicoides* subsp. *taraxicoides, Senecio pterophorus* and *Baccharis halimifolia*. For other exotic species there is virtually no data from local sources — some of these are based on only one or a few old records and may now be extinct in the region e.g. *Ambrosia artemisiifolia*.

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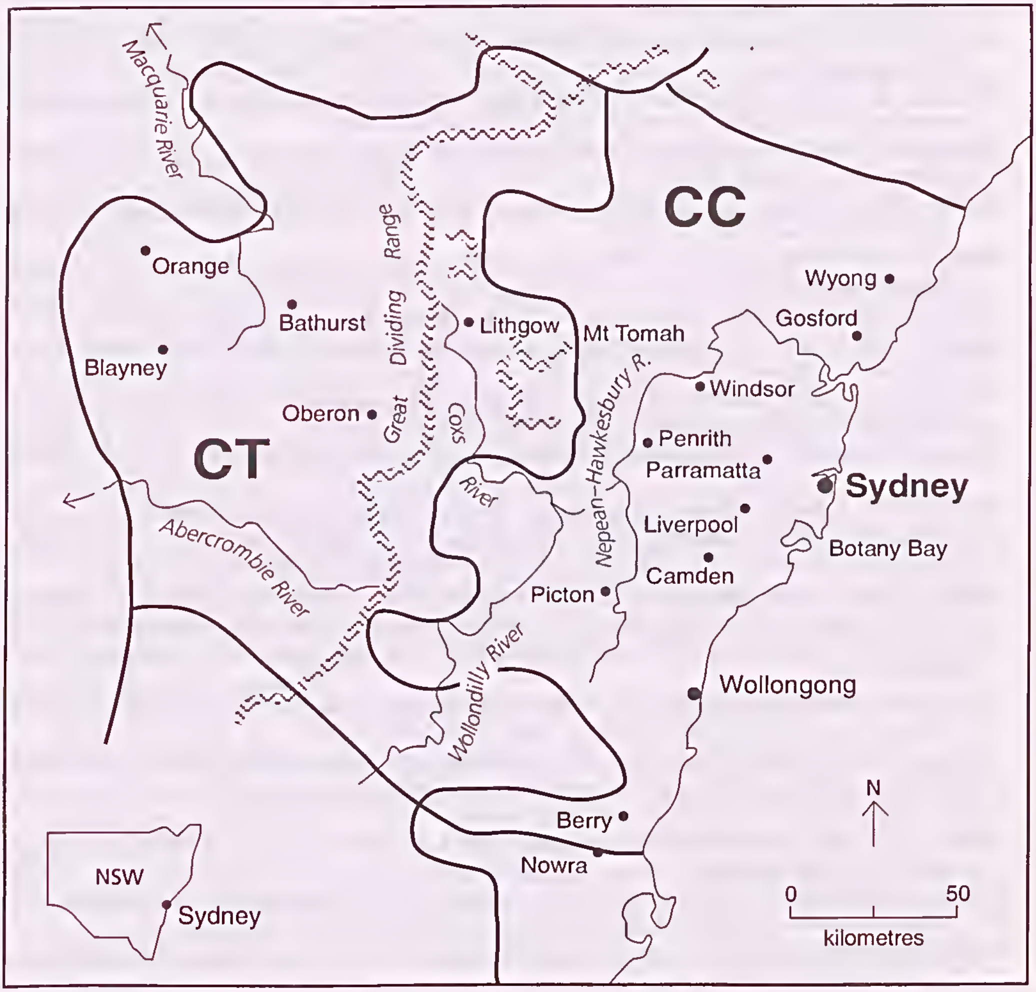

The Sydney region

For this work the Sydney region is defined as the Central Coast and Central Tablelands botanical subdivisions.

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Dicotyledon families Asteraceae to Buddlejaceae

Acanthospermum australe * ASTERACEAE

Life history

Growth form: Prostrate herb with stems to 60 cm long and opposite leaves.
Vegetative spread:
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, summer.
Fruit/seed: Achene 7–9 mm long with prickles, mature December–March.
Dispersal, establishment & growth: Diaspore: fruit, probably mammal-dispersed, ? human.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to America.
Botanical subregions: NC CC.
Distribution Sydney area: Coastal, mainly eastern suburbs of Sydney.
Select locations: Malabar (1967), Little Bay, Matraville, La Perouse, Garie Beach (1987).

Habitat

Habitat: Roadsides and lawns.
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: With other roadside weeds e.g. *Oenothera indecora*. Ground stratum.
Substrate: Sandy, infertile soils. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Recently recorded weed that may be spreading along coast.

Achillea distans subsp. *tanacetifolia* * ASTERACEAE

Tansyleaf Milfoil

Life history

Growth form: Herb to 120 cm high, with rhizome.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Whitish, pink or red with yellow disc, spring–summer.
Fruit/seed: Achene 1.5–2.5 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe. Introduced as an ornamental and may occur as a garden escape.
Botanical subregions: CC SC NT ST; Qld, NT.
Distribution Sydney area: Only record Leichhardt.
Select locations: Leichhardt (1941).

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare, only 1 record, probably not naturalised in the area.

Achillea millefolium * ASTERACEAE

Yarrow

Life history

Growth form: Stoloniferous herb 10–100 cm high.
Vegetative spread: Regrows from rhizome fragments (Field & Kannangara 1987).
Longevity: Perennial.
Primary juvenile period:
Flowers: White–pink, disc yellow, November–April.
Fruit/seed: Achene to 3 mm long, no pappus. Seeds small 160 µg (Field & Kannangara 1987).
Dispersal, establishment & growth: Wind-dispersed (Carr et al. 1992). Eight month old stand produced 243,000 seeds per m^2; requires light for germination — seed at or near the soil surface germinates rapidly; seed viability increases with soil depth — estimated survival of seed buried at 32 cm is 17 years (Field & Kannangara 1987).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC SC NT CT ST SWS; Vic.
Distribution Sydney area: Upper Blue Mountains and west of the area.
Select locations: Mt Wilson (1896), Katoomba, Lett River, Lithgow, Orange, Milthorpe.

Habitat

Habitat: Roadside weed.
Altitude: above 800 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Ground stratum.
Substrate: Basalt soil, very fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Roadside weed.

Actites megalocarpa (Sonchus megalocarpus) ASTERACEAE

Dune Thistle

Life history

Growth form: Fleshy herb to 40 cm high, responds to sand accumulation by vertical growth.
Vegetative spread: Forms large clumps by creeping rhizome.
Longevity: Indefinite.
Primary juvenile period: 1 year (Clarke 1989).
Flowers: Yellow, sometimes pale purple towards the base, September–May.
Fruit/seed: Achene 4–8 mm long with pappus of bristles 7–13 mm long, matures September–May.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, vegetative multiplication absent; seedlings sun-tolerant, wind-tolerant; adults wind-tolerant, drought-tolerant (Clarke 1989). Adults tolerant of salinity, secondary sand coloniser.
Fire response: Unlikely to be burnt.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area:
Select locations: North Avoca, Wamberal, Palm Beach, Narrabeen, Manly, Bondi, Lady Robinson's Beach (1887), Cronulla, Shoalhaven Heads.

Habitat

Habitat: Coastal sand dunes and cliffs, on the incipient foredune and the foredune.
Altitude: 0–20 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.

Vegetation:
Substrate: Beach sand dunes, infertile, tolerant of underdeveloped soils.
Exposure: Exposed to salt-laden sea breezes, full sun.

Conservation

Conservation: Most herbarium records are pre- 1950. Possibly now less common than previously due to loss of habitat.

Adenostemma lavenia var. *lavenia* ASTERACEAE

Sticky Daisy

Life history

Growth form: Semi-prostrate or erect herb 0.3–1 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, spring–early summer.
Fruit/seed: Achene 2–4 mm long, with pappus of bristles 1 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC; Qld, N.T., Asia.
Distribution Sydney area: Chiefly north from Bulahdelah, with an old record from Botany Bay (Harden 1992).
Select locations: No CC specimens in Herbarium.

Habitat

Habitat: Damp, shaded places (Harden 1992).
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Botany Bay southern limit, but now probably extinct in area.

Ageratina adenophora * ASTERACEAE

Crofton Weed

Life history

Growth form: Herb, with purplish, woody stems 1–2 m high from underground crown; short, thick rootstock has carrot-like odour when broken (Parsons & Cuthbertson 1992).
Vegetative spread: Colonies increase in size when layering occurs; spread also occurs when pieces of root with portion of the crown attached take root (Parsons & Cuthbertson 1992).
Longevity: Perennial.
Primary juvenile period:
Flowers: White, spring, September–November.
Fruit/seed: Achene 1–2 mm long with pappus of hairs 3–4 mm long. 'Seeds' light (25,000 seeds/gm); mature plant can produce 10,000–100,000 seeds per year (Dyason 1986).

Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed both locally and long distance. Also water-dispersed (M. Clarke pers. comm.). Dispersed in mud sticking to humans, animals, machinery and in agricultural produce, seeds germinate in light December–September, peak (more than 80% of viable seeds) in February and March; seedlings establish rapidly and if damaged are able to regenerate from the crown within 8 weeks of germination (Parsons & Cuthbertson 1992). Seedlings shade-tolerant, may be frost-sensitive. Coloniser.
Fire response: Stems killed, resprouts at ground level. Resprouted from base and flowered

within 33 weeks after high-intensity fire (1/1994) at Lane Cove and Narrabeen (P. Kubiak pers. comm.)
Interaction with other organisms: Suspected of poisoning but seedlings palatable to stock; biological controls (insect and fungus) have been introduced but are not highly effective (Dyason 1986). Unpalatable to cattle but horses eat it readily, and die; sheep or goats can eat it without harm if other pasture is available. Biological control effective using a combination of organisms (Parsons & Cuthbertson 1992). Current experimental work with fungus *Phaeoramularia* species at Royal Botanic Gardens (Wang Fang pers. comm. 1994).

Distribution

Status/origin: Naturalised exotic, native to C America. Introduced to Sydney c. 1875 from England where it had been grown as a 'stove ornamental', first collected as a garden escape in 1904 (Parsons & Cuthbertson 1992). Story from Lismore: Mayor Crofton on his deathbed said words to the effect of 'it wasn't me who introduced the plant, it was my next door neighbour' (M. Clarke pers. comm.).

Botanical subregions: NC CC; Qld, S.A.
Distribution Sydney area: Coastal, current southern limit Kiama.
Select locations: Morisset, Mooney Creek, Cheltenham, Lane Cove River (1918), Willoughby, Eastwood, Kurnell, Liverpool, Wollongong, Minnamurra Falls, Springwood.

Habitat

Habitat: Moist sites, disturbed areas, roadsides, creeklines. Steeply sloping, frost-free land (Parsons & Cuthbertson 1992).
Altitude: 0–400 m **Annual rainfall:** above 800 mm
Typical local abundance: Dominant.
Vegetation: Open areas–woodland and forest. Ground stratum.

Substrate: Sandstone and shale soils, fertile–infertile. Watertable permanently high–mostly high, moisture supply continuous–intermittent, fresh.

Exposure: Sheltered situations; mid-light shade. High growth-rate of seedlings in full sun, can tolerate considerable shade but die in full shade (Parsons & Cuthbertson 1992). Full sun if moisture available (M. Clarke pers. comm.).

Conservation

Conservation: Present in the Sydney area for more than 30 years and has spread rapidly there since the 1970s (Dyason 1986), Crofton weed control usually depends on correcting the drainage problem that allowed the weed to establish (McLoughlin & Rawling 1990). Major weed of moist sites in bushland. Declared noxious weed in many shires.

Ageratina riparia * ASTERACEAE

Mist Flower

Life history

Growth form: Herb 0.3–1 m high, stems purplish, erect, or decumbent, often with adventitious roots.
Vegetative spread: Stems in contact with soil form new plants by rooting from nodes (L.McD.). Colonies increase in size and density by layering, forming a mat of interwoven stems (Parsons & Cuthbertson 1992).
Longevity: Indefinite.
Primary juvenile period:
Flowers: White, August–November.
Fruit/seed: Achene 1–2 mm long, with pappus of hairs 3–4 mm long, mature September–December. Mature plants produce 10,000–100,000 seeds per year (Parsons & Cuthbertson 1992).
Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed, both locally and long distances. Water-dispersed, in mud by humans and animals, and dispersed as stem fragments; seed germinates immediately, but only in light, best at temperatures of 25° C–15° C (Parsons & Cuthbertson 1992).

Fire response: Resprouted from base after high-intensity fire (1/1994) at Lane Cove, flowering within 34 weeks (P. Kubiak pers. comm.) Stems killed, resprouts at ground level (R. Buchanan pers. comm.).
Interaction with other organisms: May be toxic to stock; leachates from leaves and plant litter have an allelopathic effect on other plants (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to Central America; garden escape. Growing in Royal Botanic Gardens Sydney 1895 (Parsons & Cuthbertson 1992).
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Coastal, north from Berry.
Select locations: Gosford, Galston Gorge, Pennant Hills, Northbridge, Sydney (1906), Bellevue Hill, Royal NP, Albion Park, Macquarie Pass (P. Kodela pers. comm.), Jamberoo, Foxground.

Habitat

Habitat: Disturbed gullies and creek banks.
Altitude: 0–200 m **Annual rainfall:** above 1200 mm
Typical local abundance: Dominant–frequent.
Vegetation: Ground stratum. In or near rainforest, along creeks.
Substrate: Creeks and gullies in sand and amongst rocks, sandstone. Soil fertile–infertile. Watertable mostly high, moisture supply continuous, fresh.
Exposure: Sheltered. Shade deep–mid. Seedling very shade-tolerant (R. Buchanan pers. comm.).

Conservation

Conservation: A declared noxious weed in many shires, invading bushland along creeklines.

Ageratum houstonianum * ASTERACEAE

Life history

Growth form: Erect or decumbent herb 0.3–1 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Blue-mauve, most of the year.
Fruit/seed: Achene, 2 mm long, with pappus of awned scales 2–3 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Mexico; widespread in Central America. Garden escape, rarely naturalised.
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Coastal Sydney.
Select locations: Palm Beach (1961), Narrabeen Lake, Glenfield.

Habitat

Habitat: Roadside, paddocks, creek bank.
Altitude: 0–50 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation: Weedy sites.
Substrate: Probably clay soils.
Exposure:

Conservation

Conservation: Rarely naturalised in bushland.

Ambrosia artemisiifolia * ASTERACEAE

Annual Ragweed

Life history

Growth form: Shallow-rooted herb to 2 m high.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period: Less than 1 year.
Flowers: Summer–autumn. Wind-pollinated (Ciba-Geigy 1968–).

Fruit/seed: Nut-like involucre, achene retained inside, one per fruit. Seed may remain viable in soil for 40 years or more in US.A. (Payne 1970).

Dispersal, establishment & growth: Dispersed by wind, water, animals and humans (with red clover seed from US); germinates in spring; tends to occur in masses (Ciba-Geigy 1968–). Considerable variability in progeny enhances survival of this species (Payne 1970).

Fire response: ? Resprouted — one plant flowering within 13 weeks of high-intensity fire (1/1994) at Narrabeen (P. Kubiak pers. comm.)

Interaction with other organisms: Known to cause hay fever and severe allergic conjunctivitis in humans, potential to cause asthma (Bass & Wrigley 1984). Potential to cause asthma in humans (Bass 1987). Cattle eating it develop sore mouths (Hurst 1942).

Distribution

Status/origin: Naturalised exotic, native to N America.
Botanical subregions: NC CC; Qld, S.A.
Distribution Sydney area: Only Sydney record, Cremorne (1948).
Select locations: Cremorne (1948)

Habitat

Habitat: Roadsides, wasteland and cultivation.
Altitude: 0–50 m **Annual rainfall:** > 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Weed of wasteland and cultivated areas north of Sydney, no recent records for Sydney area.

Ambrosia psilostachya * ASTERACEAE

Perennial Ragweed

Life history

Growth form: Erect, stout herb to 2 m high, with rhizomes to almost 1 m deep; leaves aromatic.
Vegetative spread: Spread by creeping rhizomes and through cultivation — stimulation of new growth from damaged plant and pieces of rhizome (Parsons 1973). Often forms extensive colonies.
Longevity: Indefinite.
Primary juvenile period:
Flowers: Cream or green, late spring–summer (Parsons 1973).
Fruit/seed: Nut-like involucre with short spines, achene retained inside, one per fruit.

Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed over long distance due to spines on fruit; seeds germinate in autumn, plants develop rapidly in winter and spring developing extensive perennial roots and rhizomes, flowers late spring, aerial growth dies off in summer, new growth from buds on rhizomes in autumn; seeds can survive in soil for several years (Parsons 1973).
Fire response: Probably resprouts.
Interaction with other organisms: Pollen causes hay fever and severe allergic conjunctivitis in humans (Bass & Wrigley 1984). Not grazed by stock (Parsons 1973).

Distribution

Status/origin: Naturalised exotic, native to America. First recorded in Australia at Tomingley in NSW, 1924 (Parsons 1973).
Botanical subregions: NC CC NT CT NWS CWS SWS NWP SWP; Qld, Vic.
Distribution Sydney area: Mainly northern suburbs of Sydney.
Select locations: Lisarow, Mona Vale, Dee Why, Frenchs Forest, Willoughby, Mosman (1934), Earlwood, Orange.

Habitat

Habitat: Roadside, paddock.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Uncommon–prolific.

Vegetation: Roadside and wasteland weeds.
Substrate: Sandy soil, damp sites, banks, possibly disturbed soil.
Exposure:

Conservation

Conservation: Declared noxious weed in some shires.

Ambrosia tenuifolia * (Ambrosia confertifolia) ASTERACEAE

Lacy Ragweed

Life history

Growth form: Erect, aromatic herb to 75 cm high with long runner roots.
Vegetative spread: Spreads by long, underground, runner-like roots (Cunningham et al. 1981).
Longevity: Indefinite.
Primary juvenile period:
Flowers: Light green, December–April. Male flowerheads numerous, female heads single or few together (Cunningham et al. 1981).
Fruit/seed: Nut-like involucre with minute black achenes retained inside.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: May cause hay fever and severe allergic conjunctivitis in humans (Bass & Wrigley 1984).

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC CT NWS CWS SWP NFWP; Vic., S.A., W.A.
Distribution Sydney area: Suburban areas.
Select locations: Wondabyne, Neutral Bay, Mascot, Ashfield (1932), Clyde, Granville, Albion Park, Moss Vale.

Habitat

Habitat: Railway lines, disturbed areas.
Altitude: 0–900 m **Annual rainfall:** above 1000 mm
Typical local abundance: Common.
Vegetation: Weedy vegetation including, e.g. *Cortaderia selloana*, *Phragmites*.
Substrate: Sandy soil.
Exposure:

Conservation

Conservation: Declared noxious weed in some shires.

Ammobium alatum ASTERACEAE

Life history

Growth form: Herb 60–100 cm high.
Vegetative spread:
Longevity: Perennial or facultative annual.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, November–March.
Fruit/seed: Achene 3–4 mm long, with pappus a membranous cup 0.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Suspected of causing string-halt in horses and death of stock (Hurst 1942).

Distribution

Status/origin: Native.
Botanical subregions: NC SC NT CT ST NWS CWS; Qld, *S.A.
Distribution Sydney area: Mainly cooler parts of the area.
Select locations: Kanimbla Valley, Mandurama, Orange, Bowral, Moss Vale, Mittagong (1938).

Habitat

Habitat: Grassland and woodland, roadsides.
Altitude: above 500 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional–frequent.
Vegetation: Grassland and woodland, roadsides,, e.g. with *Acacia mearnsii.*
Substrate:
Exposure: Full sun.

Conservation

Conservation:

Anthemis arvensis * ASTERACEAE

Corn Chamomile

Life history

Growth form: Herb to 60 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: White, disc yellow, December–February. Insect and self-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 1.5–2.5 mm long, pappus an irregular rim, mature February.
Dispersal, establishment & growth: Probably wind-dispersed (is ligule persistent for long enough to aid dispersal ?) Dispersed by wind, water, animals and humans (with white clover seeds); germinates in spring and autumn; moderate to vigorous user of nutrients and competitor for space (Ciba-Geigy 1968–).
Fire response: Probably killed.
Interaction with other organisms: Used in folk medicine for wound-healing and as a vermifuge (Ciba-Geigy 1968–).

Distribution

Status/origin: Naturalised exotic, native to S Europe. World-wide in temperate zones, companion since early Stone Age, now strongly regressing (Ciba-Geigy 1968–).
Botanical subregions: NC NT CT; Vic., Tas., S.A.
Distribution Sydney area: Taralga area.
Select locations: Wombeyan Caves (1921), Richlands (1962).

Habitat

Habitat: Fields.
Altitude: 800 m **Annual rainfall:** 800 mm
Typical local abundance: Frequent.
Vegetation: Grassy sites.
Substrate: Nitrogenous soils, moist situations, indicator of acidity (Ciba-Geigy 1968–).
Exposure:

Conservation

Conservation: Localised exotic, rarely recorded.

Anthemis cotula * ASTERACEAE

Stinking Mayweed

Life history

Growth form: Herb to 60 cm high with foetid scent.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, disc white–cream November–April.
Fruit/seed: Achene 1.5 mm long, no pappus.
Dispersal, establishment & growth: Dispersed by water, animals and humans (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms: 'rather a trouble on cultivated land but good food for

horses and cattle when ripening' (James Walsh 1904 — Herbarium note). Thought to taint milk (Herbarium note).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia and Africa.
Botanical subregions: NC CC SC NT CT ST SWS NWP SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Coast and Bathurst–Orange.
Select locations: Ourimbah, Turramurra, Royal Botanic Gardens (1902), Flemington, Jamberoo, Jenolan Caves, Bathurst, Orange (1907).

Habitat

Habitat: Saleyards, paddocks.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Occasional–frequent.
Vegetation: Grasslands, cultivated land.
Substrate: Agricultural soils. Nitrogenous soil, clay indicator (Ciba-Geigy 1968–).
Exposure:

Conservation

Conservation: Weed of cultivated areas.

Arctium lappa * ASTERACEAE

Greater Burdock

Life history

Growth form: Herb 1–1.5 m high.
Vegetative spread:
Longevity: 2 years.
Primary juvenile period:
Flowers: Purplish-red, summer–autumn.
Fruit/seed: Achene 6–7 mm long, with pappus 1–3.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CT; Qld, Vic., N.Z.
Distribution Sydney area: Carcoar.
Select locations: 3 miles from Orange (1968) (only record).

Habitat

Habitat: Roadside.
Altitude: 700 m **Annual rainfall:** 700 mm
Typical local abundance:
Vegetation: Roadside vegetation.
Substrate: Shaley soil.
Exposure:

Conservation

Conservation: Only record indicates 'isolated infestation of a few square yards'.

Arctium minus * ASTERACEAE

Common Burdock

Life history

Growth form: Herb 0.5–1.5 m high.
Vegetative spread:
Longevity: 2 years.
Primary juvenile period:
Flowers: Pink or purplish, summer–autumn.
Fruit/seed: Achene 5–7 mm long, with pappus 1–3.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CT NWP SWP; Tas.
Distribution Sydney area: Orange area (Harden 1992).
Select locations: No specimens for Sydney area.

Habitat

Habitat: Roadsides and disturbed sites.
Altitude: 800 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Localised weed of disturbed sites.

Arctotheca calendula * (Cryptostemma calendula)

ASTERACEAE

Cape Weed, Cape Dandelion

Life history

Growth form: Herb to 30 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Pale yellow, greenish or purple, September–November.
Fruit/seed: Achene 2 mm long with pappus of short scales.
Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed (Carr et al. 1992).
Fire response:

Interaction with other organisms: Known to cause allergy in humans where density is high (Bass 1987). Foodplant of butterfly caterpillar *Vanessa kershawi* (Coupar & Coupar 1992). Seeds eaten by Brown Songlark *Cinclorhamphus cruralis* (Barker & Vestjens 1989,1990). Flowers eaten by Galah *Cacatua roseicapilla*, roots eaten by Sulphur-crested Cockatoo *Cacatua galerita*; flowers, seed, leaf midrib eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to S Africa.
Botanical subregions: NC CC SC CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Coast, western Blue Mountains, Southern Highlands (P. Kodela pers. comm.).
Select locations: Gosford, Cheltenham, Brighton-le-sands, Cooks River (1912), Coogee, Cabramatta, Casula, Jenolan Caves (1899), Orange, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Lawns, pastures and cultivated areas.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Pasture, lawn, edges of bushland.
Substrate: Beach sand, roadside gravel. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Exposed, full sun.

Conservation

Conservation: Unlikely to invade bushland.

Arctotheca populifolia * (Arctotheca nivea)

ASTERACEAE

Beach Daisy

Life history

Growth form: Semi-succulent herb to 30 cm high, with spreading growth.
Vegetative spread:
Longevity: Perennial.

Primary juvenile period:
Flowers: Yellow, most of the year.
Fruit/seed: Achene 5 mm long, covered with greyish wool, pappus of minute scales.
Dispersal, establishment & growth: Diaspore: fruit, blown across ground or floats on water (buoyant for a few days). Possibly wind-dispersed (Carr et al. 1992). Seeds not dormant, high germination rate when fresh (and easily propagated (Heyligers 1983). Primary coloniser species of upper beach and mobile dunes. Drought-tolerant.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa, first collected in W.A., 1930.
Botanical subregions: NC CC SC; Vic., S.A., W.A.
Distribution Sydney area: Coastline, first reported near Newcastle in 1930s (Nelson Bay 1937) and spread south to Brou Lake by 1981 (Heyligers 1983).
Select locations: The Entrance (1946), Marley Beach (1971).

Habitat

Habitat: Unstable littoral habitats, sandy hollows between dunes.
Altitude: 0–20 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Pioneer of beach sand on front dunes with *Spinifex sericeus*.
Substrate: Beach sand dunes, calcareous and siliceous sand, infertile.
Exposure: Exposed to salt spray, full sun, tolerant of sand blast.

Conservation

Conservation: Suggested for beach stabilisation by Heyligers (1983) as it does not show any tendency to spread beyond the habitats to which it is confined in Africa (i.e. upper beach and mobile dunes) or compete with young native shrubs on the dunes.

Arctotis stoechadifolia * ASTERACEAE

White Arctotis

Life history

Growth form: Spreading herb to 35 cm high.
Vegetative spread: Forms mats.
Longevity: Perennial.
Primary juvenile period:
Flowers: Ray florets white above, mauve below, with a dark band at the base, disc purple-black, August–October.
Fruit/seed: Achene 3–4 mm long, with pappus of scales 3–4 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa.
Botanical subregions: NC CC CWS; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Northern Illawarra coast.
Select locations: Thirroul (1946), Austinmer (1966).

Habitat

Habitat: Weed of roadsides, beach margins.
Altitude: 0–50 m **Annual rainfall:** above 1400 mm
Typical local abundance: Isolated clumps.
Vegetation: Beach margins.
Substrate: Sandy soils, infertile.
Exposure:

Conservation

Conservation: Garden escape unlikely to be spreading generally, though possibly spreading locally.

Arrhenechthites mixta ASTERACEAE

Purple Fireweed

Life history

Growth form: Herb to 90 cm high.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, December–March.
Fruit/seed: Achene 5–7 mm long with pappus of white bristles 10–15 mm long, mature December–March.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST; Vic.
Distribution Sydney area: Blue Mountains.
Select locations: Clarence, Blackheath, Mt Victoria, Mt Wilson, Jenolan Caves, Hilltop, Wingello.

Habitat

Habitat: Mostly in gullies.
Altitude: 700–1200 m **Annual rainfall:** above 900 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt woodland, ground stratum.
Substrate: Sandstone–shale, infertile soil. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: Sheltered.

Conservation

Conservation: Conservation status unknown.

Artemisia verlotiorum * ASTERACEAE

Chinese Wormwood, Mugwort

Life history

Growth form: Herb to 1 m, dying back to rootstock annually.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: February–March. Wind and self-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene, 1–1.5 mm long, no pappus, mature May.
Dispersal, establishment & growth: Diaspore: seed. Water and wind-dispersed (Carr et al. 1992). Germinates in light; moderate–vigorous competitor for space and user of nutrients (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms: Formerly used as a medicine, condiment, and for rites; unpleasant scent deters domestic animals; pollen causes hay-fever (Ciba-Geigy 1968–).

Distribution

Status/origin: Naturalised exotic, native of SW China.
Botanical subregions: NC CC SC NT CT ST CWS SWS SWP; Qld, Vic.
Distribution Sydney area: Coast and upper Blue Mountains.
Select locations: Manly, Vaucluse, Dundas (1911), Beecroft, Katoomba, Lithgow, Wallerawang (1937), Moss Vale.

Habitat

Habitat: Disturbed areas, often in moist sites.
Altitude: 0–1100 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Mid stratum.

Substrate: Shale and sandstone soils, fertile–infertile.
Exposure:

Conservation

Conservation: Naturalised exotic, apparently posing little problem.

Aster novi-belgii *

ASTERACEAE

Michaelmas Daisy

Life history

Growth form: Herb 0.2–1.4 m high, with long rhizomes.
Vegetative spread: Spreads by creeping root system.
Longevity: Indefinite.
Primary juvenile period:
Flowers: Purplish-blue, January–March.
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to N America, garden escape.
Botanical subregions: CC CT.
Distribution Sydney area: Sydney suburbs and upper Blue Mountains.
Select locations: Northbridge (1965), Katoomba (1979), Portland (1982).

Habitat

Habitat: Moist swamps, gullies and on roadsides.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Occasional.
Vegetation:
Substrate: Sandy soils from sandstone, infertile, moist sites.
Exposure:

Conservation

Conservation: Occasional garden escape, naturalised near habitation.

Aster subulatus *

ASTERACEAE

Wild Aster, Bushy Starwort

Life history

Growth form: Herb 0.3–1.8 m high.
Vegetative spread: No.
Longevity: Annual, biennial or short-lived perennial.
Primary juvenile period: 1 year.
Flowers: White, pink or blue, at any time throughout the year.
Fruit/seed: Achene, 1.5–2 mm long, with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit; water, wind, and possibly animal-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to N America.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; LHI, Qld, Vic., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Dural, Epping, Sandringham (1902), Kurnell, Milperra, Richmond, Camden, Warrimoo, Wolgan Valley, Kowmung River, Bowral.

Habitat

Habitat: Riverbanks, swamp edges and roadside drains.
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional–frequent.
Vegetation: Swamp edges,, e.g. with *Ludwigia peploides, Paspalum distichum.*

Substrate: Seasonally wet, poorly drained or damp areas on sand, sandstone, shale and alluvium. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Minor weed though may be important in wetland sites.

Baccharis halimifolia * ASTERACEAE

Groundsel Bush

Life history

Growth form: Shrub 1–6 m high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellowish, December–May.
Fruit/seed: Achene 1–1.7 mm long with pappus of numerous hair-like bristles.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms: Regarded as poisonous to sheep, suspected of poisoning other stock (Hurst 1942).

Distribution

Status/origin: Naturalised exotic, native to eastern N America.
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Illawarra coast.
Select locations: Wollongong (1982), Shellharbour (1984).

Habitat

Habitat: Near the sea, also in swampy areas, low-lying pasture and disturbed sites.
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Often behind mangroves, or low-lying pasture.
Substrate: Sands, infertile.
Exposure: ? full sun.

Conservation

Conservation: Recently recorded for Sydney area, declared noxious weed in some shires.

Bidens pilosa * ASTERACEAE

Cobblers Pegs, Pitch-forks

Life history

Growth form: Woody herb to 1.5 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: 18 weeks (P. Kubiac pers. comm.).
Flowers: Usually white, throughout the year but mainly March–May.
Fruit/seed: Achene with pappus of barbed awns, mature at any time but mainly March–May. Single plant can produce 3000–6000 seeds, 80 % still capable of germination after 3–5 years stored in soil (M. Clarke pers. comm.). An indeterminate number capable of germination after more than 30 years (R. Buchanan pers. comm.).
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed (e.g. on human clothing).
Fire response: Probably killed, vigorous recruitment from seed after high-intensity fire (1/1994) at Narrabeen; most likely from soil-stored seed (M. Clarke pers. comm.). Mature fruit within 18 weeks of high-intensity fire (1/1994) at Narrabeen and Lane Cove (P. Kubiak pers. comm.)
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America. Used medicinally, in Asia, New Guinea, and Polynesia (Cambie & Ash 1994).

Botanical subregions: NC CC SC NT ST NWS CWS NWP SWP; LHI, Qld, Vic., N.T., S.A., W.A.
Distribution Sydney area: Mainly coastal.
Select locations: Gosford, Palm Beach, Wahroonga, Belrose & Cherrybrook (P. Kodela pers. comm.), Port Jackson (1886), La Perouse, Cabarita, Wollongong, Albion Park, Grose Vale, Ingleburn, Razorback.

Habitat

Habitat: Disturbed sites, roadsides.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: With other weeds of frequently disturbed sites.
Substrate: Clay soils from Wianamatta Shale, sandstones, alluvium, fill etc., any substrate (R. Buchanan pers. comm.), no special requirements for nutrient, moisture etc. (M. Clarke pers. comm.).
Exposure: Light shade–full sun.

Conservation

Conservation: Common weed, in recently or frequently disturbed sites.

Bidens subalternans * ASTERACEAE

Greater Beggar's Ticks

Life history

Growth form: Woody herb to 1.6 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, March–April.
Fruit/seed: Barbed achene, with pappus of barbed awns, mature February–June.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed,, e.g. on clothing.
Fire response: Probably killed; flowering within 12 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.)
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC NWS CWS NWP SWP; Qld.
Distribution Sydney area: Mainly Western Sydney.
Select locations: Lindfield (1951), Parramatta, Cattai Creek, Emu Plains, Casula, Camden, Menangle, Albion Park.

Habitat

Habitat: Disturbed sites — along railway lines, wasteland, roadsides.
Altitude: 0–200 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Common.
Vegetation: With other weeds,, e.g. *Bidens pilosa*, *Sida rhombifolia*.
Substrate: Sandy soils, consolidated sand dune, infertile.
Exposure:

Conservation

Conservation:

Bidens tripartita * ASTERACEAE

Burr Marigold

Life history

Growth form: Woody herb to 1 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow, March–May.
Fruit/seed: Barbed achene, 4–8 mm long, with pappus of barbed awns 2–4 mm long, mature March–May.

Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed.
Fire response: Probably killed; flowering and fruiting within 15 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST; Vic.
Distribution Sydney area: Mainly coastal.
Select locations: Centennial Park, Macquarie Pass, Bellawongarah, (1904), Cambewarra, Bowral, Wingecarribee Swamp (P. Kodela pers. comm.).

Habitat

Habitat: Swampy ground, damp pasture (P. Kodela pers. comm.).
Altitude: 0–700 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Margin of swamps.
Substrate: Moist sites, poorly-drained.
Exposure:

Conservation

Conservation:

Brachycome aculeata ASTERACEAE

Hill Daisy

Life history

Growth form: Herb to 60 cm high. Populations vary in shape of leaves and branching of inflorescence.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White–mauve, September–May.
Fruit/seed: Achene, flattened, 3–4 mm long, with pappus a small tuft of bristles 0.3 mm long.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS NWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Mostly Bathurst to Taralga, early records from Sydney area.
Select locations: Palm Beach (1916), Parramatta (von Mueller), Richmond (1913), Richlands, Black Range, Jenolan Caves, Jenolan SF, Bathurst, Wombeyan Caves, Mittagong, Barbers Creek (1899). (Some material on loan.)

Habitat

Habitat: Roadside.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance:
Vegetation: Grassland, ground stratum.
Substrate: Well drained to dry sites.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome angustifolia var. *angustifolia* ASTERACEAE

Life history

Growth form: Stoloniferous, ascending herb to 35 cm high; leaves entire.
Vegetative spread: Stoloniferous.
Longevity: Indefinite, stolons up to 10 cm long forming new plants; vegetative production of new plants may allow continued replacement as old plants die.
Primary juvenile period:
Flowers: Pink, blue or mauve, November–March.
Fruit/seed: Achene, flattened 2 mm long, pappus 0.4 mm long.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response: Possibly resprouts from stolons. Flowering within 11 weeks and fruiting within 16 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS; Vic., Tas., S.A.
Distribution Sydney area: Coast and western Sydney, Blue Mountains.
Select locations: Warnervale, Gordon, Ermington, Duck River, Cronulla, Appin, Douglas Park, Llandillo, Lidsdale, Katoomba, Kowmung River, Bowral. (Some material on loan.)

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Moist–dry eucalypt open-forest. Ground stratum.
Substrate: Clay soils from shales, also sandstone. Fertile soil. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: Sheltered.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Brachycome angustifolia var. *heterophylla* ASTERACEAE

Life history

Growth form: Stoloniferous, ascending herb to 35 cm high, leaves pinnatisect to deeply toothed.
Vegetative spread: Stoloniferous.
Longevity: Indefinite.
Primary juvenile period:
Flowers: Pink, blue or mauve, November–March.
Fruit/seed: Achene, flattened, 2 mm long, pappus of bristles, 0.4 mm long.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS; Vic.
Distribution Sydney area: Mainly western Blue Mountains and southern Highlands.
Select locations: North of Windsor, Toongabbie (1859), El Dorado, Mt Costigan, Abercrombie Caves, Stingray Swamp, Wingecarribee Swamp, Joadja. (Some material on loan.)

Habitat

Habitat: Eucalypt open-forest.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation: Eucalypt open-forest.
Substrate: Possibly associated with swampy soils.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome decipiens ASTERACEAE

Field Daisy

Life history

Growth form: Herb to 20 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Pale blue, September–November.
Fruit/seed: Achene 3 mm long, with minute pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: CT ST; Vic., Tas.
Distribution Sydney area: Chiefly south from Braidwood area (Harden 1992).
Select locations: Jenolan Caves (1899). (Some material on loan.)

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation: Subalpine and montane woodland and swamps (Harden 1992).
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome diversifolia var. *dissecta* ASTERACEAE

Large-headed Daisy

Life history

Growth form: Herb to 45 cm high; leaves 2-pinnatisect.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White-mauve, June–December.
Fruit/seed: Achene 2–3 mm long, with pappus of hairs 0.5 mm long, mature February.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT NWS NWP; Qld.
Distribution Sydney area: Western Blue Mountains.
Select locations: Rylstone (1938), Katoomba (1932). (Some material on loan.)

Habitat

Habitat: Rocky outcrops.
Altitude: 700–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate: Soil pockets in depressions of rocky outcrops.
Exposure:

Conservation

Conservation: Southern limit Katoomba; possibly rare. Conservation status unknown.

Brachycome diversifolia var. *diversifolia* ASTERACEAE

Large-headed Daisy

Life history

Growth form: Herb to 45 cm high; leaves 1-pinnatisect.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White–mauve, November–April.
Fruit/seed: Achene 2–3 mm long, with pappus of hairs 0.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST SWS; Tas., S.A.
Distribution Sydney area: Western Blue Mountains.
Select locations: Capertee, Zig Zag, Blackheath, Mt Victoria, Sunny Corner. (Some material on loan.)

Habitat

Habitat: Damp rocky areas.
Altitude: 700–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate: Sandy soil — damp rocky areas.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome formosa ASTERACEAE

Pilliga Posy

Life history

Growth form: Rhizomatous herb to 15 cm high. Chromosome number n = 9 (Short 1988).
Vegetative spread: Possibly.
Longevity: Perennial.
Primary juvenile period:
Flowers: Pink, September–November.
Fruit/seed: Achene 2–3 mm long, wing narrow, with slightly inflated, pappus 0.2 mm long. Observations of low seed set in cultivated specimens suggests self-incompatibility (Short 1988).
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT NWS CWS.
Distribution Sydney area: Bathurst area.
Select locations: Bathurst–Grattai Rd (1953), high mountains near Mudgee (1872) (Short 1988). (Some material on loan.)

Habitat

Habitat: In grass along roadside, on sandstone ridges (Short 1988).
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Dry eucalypt open-forest and woodland with sparse shrub understorey. Under *Angophora floribunda* (Short 1988).
Substrate:
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Brachycome graminea ASTERACEAE

Life history

Growth form: Stoloniferous herb to 70 cm high.
Vegetative spread: Stoloniferous.
Longevity: Perennial.
Primary juvenile period:
Flowers: Blue–violet, December–February.
Fruit/seed: Achene 2 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST; Qld, Vic., Tas., S.A.
Distribution Sydney area: Western Blue Mountains, also Razorback.
Select locations: Razorback, Blackheath, Newnes Junction, Capertee, Gardiners Gap, Bathurst, Blayney. (Some material on loan.)

Habitat

Habitat: Swampy ground.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland, shrub swamps.
Substrate: Swampy ground on shale and sandstone. Soil fertile–infertile, watertable mostly high, non-saline.
Exposure: No shade.

Conservation

Conservation: Conservation status unknown.

Brachycome heterodonta var. *heterodonta* ASTERACEAE

Life history

Growth form: Erect herb to 50 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White or bluish, September–December.
Fruit/seed: Achene, flattened 3–4 mm long, pappus 0.7 mm long.
Dispersal, establishment & growth: Diaspore: fruit. Short distance wind-dispersed, probably also dispersed by water.
Fire response: Probably reshoots from rhizome.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., S.A.
Distribution Sydney area:
Select locations: Bathurst to Sofala (1910). (Some material on loan.)

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome microcarpa ASTERACEAE

Life history

Growth form: Herb to 58 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White or bluish, September–February.
Fruit/seed: Achene 1–2 mm long with glandular hairs, pappus of white bristles 0.1 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT NWS; Qld.
Distribution Sydney area:
Select locations: Littleton (1893), Abercrombie Caves (1951). (Specimens on loan.)

Habitat

Habitat:
Altitude: 600–1000 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Open-forest.
Substrate: Well-drained sites.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome multifida var. *dilatata* ASTERACEAE

Cut-leaved Daisy

Life history

Growth form: Herb to 45 cm high (leaf segments broad-linear).
Vegetative spread:
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Mauve, pink or white, March–October.
Fruit/seed: Achene 2 mm long, pappus of spreading bristles 0.1 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC; Vic.
Distribution Sydney area: Wisemans Ferry.
Select locations: Wisemans Ferry (1908). (Some material on loan.)

Habitat

Habitat: Sclerophyll forest.
Altitude: 0–200 m **Annual rainfall:** 800 mm
Typical local abundance:
Vegetation: Sclerophyll forest. Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome multifida var. *multifida*

ASTERACEAE

Cut-leaved Daisy

Life history

Growth form: Herb to 45 cm high.
Vegetative spread: Sprawling stems capable of layering (L.McD.]
Longevity: Annual.
Primary juvenile period: Less than 1 year.
Flowers: Mauve, pink or white, September–June.
Fruit/seed: Achene 2 mm long, with pappus of spreading bristles 0.1 mm long.
Dispersal, establishment & growth: [Easily grown from cuttings (L.McD.]
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT NWS CWS NWP SWP SFWP; Qld, Vic.
Distribution Sydney area: Western Sydney, Minnamurra, Bathurst.
Select locations: Maroota, WIndsor, Minnamurra Falls, Bathurst, Mt Wiagdon. (Some material on loan.)

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 700 m
Typical local abundance: Frequent.
Vegetation: Sclerophyll forest or grassland (e.g. with *Eucalyptus piperita* at Maroota). Ground stratum.
Substrate: Yellow clay, infertile soil.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome procumbens

ASTERACEAE

Life history

Growth form: Stoloniferous, ascending herb to 35 cm high.
Vegetative spread: Stoloniferous.
Longevity: Perennial.
Primary juvenile period:
Flowers: September–March.
Fruit/seed: Achene 2.5 mm long, pappus 0.2 mm long.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT NWS CWS; Qld.
Distribution Sydney area: Ben Bullen SF.
Select locations: Ben Bullen SF. (Some material on loan.)

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 800 mm
Typical local abundance:
Vegetation: Open-forest, e.g. with *Eucalyptus dives* and grassy understorey.
Substrate: Clay loam. Infertile soil. Watertable mostly low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome ptychocarpa ASTERACEAE

Life history

Growth form: Glabrous herb 5–10 cm high. Some plants from the CT differ in being stoloniferous perennial herbs and could represent a new, closely related taxon.
Vegetative spread: No, (some plants from CT are stoloniferous).
Longevity: Annual, (some plants from CT are perennial).
Primary juvenile period:
Flowers: Pink, October–April.
Fruit/seed: Achene 2 mm long, with broad wings and pappus of bristles 0.2 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST CWS; Vic.
Distribution Sydney area: Bathurst–Orange
Select locations: Kandos, Wattle Flat, Meadow Flat, Glenroy, Springside, Mt Canobolas, Carcoar. (Some material on loan.)

Habitat

Habitat:
Altitude: 700–1400 m **Annual rainfall:** 600–900 mm
Typical local abundance: Occasional.
Vegetation: Woodland,, e.g. with *Eucalyptus pulverulenta* ground stratum.
Substrate: Moist ground, granite. Infertile soil.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome rigidula ASTERACEAE

Life history

Growth form: Herb to 36 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Blue, October–February.
Fruit/seed: Achene 2–3 mm long, winged; pappus of hairs 0.2 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC SC NT CT ST; Qld, Vic., Tas.
Distribution Sydney area: Western fringe of the Blue Mountains.
Select locations: Mt Walker. (Some material on loan.)

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Woodland with *Eucalyptus rossii, E. mannifera, E. dives.*
Substrate: Well-drained sites, among rocks — quartzites, siltstones.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome scapigera ASTERACEAE

Life history

Growth form: Erect, glabrous herb to 40 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White or mauve, November–March.
Fruit/seed: Achene 2–3 mm long, flattened, pappus minute (0.1 mm long).
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: SC NT CT ST NWS CWS; Qld, Vic.
Distribution Sydney area: Southern highlands.
Select locations: Jenolan Caves (1899), Wingello (1899), Wingecarribee Swamp (1969). (Some material on loan.)

Habitat

Habitat: Moist sites.
Altitude: 600–1000 m **Annual rainfall:** 800–1000 mm
Typical local abundance:
Vegetation: Ground stratum, sclerophyll forest subalpine communities (Burbidge & Gray 1976).
Substrate: Moist sites, probably low nutrient sandy sites.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome spathulata (Brachycome scapiformis) ASTERACEAE

Life history

Growth form: Erect, tufted herb to 60 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Pale blue-mauve, rarely white, October.
Fruit/seed: Achene 1–3 mm long, pappus has membranous wings and a tuft of bristles 0.2–0.8 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: SC NT ST CT CWS SWS; Vic., Tas.
Distribution Sydney area: Bathurst–Orange, Shoalhaven Heads.
Select locations: Hartley Vale, Mullions Range, Gurnang SF, Wombeyan Caves, Berrima, Shoalhaven Heads. (Some material on loan.)

Habitat

Habitat: Open areas.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland, e.g. *Eucalyptus macrorhyncha*. Ground stratum.
Substrate: Heavy red and brown clay soils; quartzitic soils.
Exposure:

Conservation

Conservation: Conservation status unknown.

Brachycome stuartii ASTERACEAE

Life history

Growth form: Erect, tufted herb to 25 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White, mauve or pale blue, April–November.
Fruit/seed: Achene 1–2 mm long with pappus of bristles 0.1 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT NWS; Qld.
Distribution Sydney area: North from Bathurst.
Select locations: Trunkey (1918). (Some specimens on loan.)

Habitat

Habitat: Swampy ground.
Altitude: **Annual rainfall:**
Typical local abundance: Frequent.
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown.

Bracteantha bracteata (Helichrysum bracteatum) ASTERACEAE

Golden Everlasting

Life history

Growth form: Herb to 1 m high with shallow root system. A variable complex that requires investigation (Harden 1992).
Vegetative spread: No.
Longevity: Short. Usually annual.
Primary juvenile period:
Flowers: Yellow or straw-coloured flowers, June–March, peak January.
Fruit/seed: Achene 1 mm long, with pappus of bristles 4 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Seedling recruitment fire or disturbance related.
Fire response: Probably killed.
Interaction with other organisms: Host to Root Knot Nematode *Meloidogyne incognita*, causes irregular swellings and galls on roots resulting in stunting and/or death of plant (Jones & Elliot 1986).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Coast, Upper Blue Mountains and Southern Highlands.
Select locations: Ingleburn, Waterfall, Mt Keira, Berry, Mt Tomah, Rylstone, Jensens Swamp, Wombeyan Caves, Wingecarribee Swamp (P. Kodela pers. comm.), The Gib, Wingello.

Habitat

Habitat: Various habitats, forest to swamplands or disturbed sites,, e.g. roadsides.
Altitude: 0–1200 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Open-forest, e.g. with *Eucalyptus pilularis* or shrubby swampland with *Restio australis*, *Empodisma minus*.
Substrate: Soils from basalt, shale, limestone, rarely sandstone, fertile–very fertile. Also in

peat (P. Kodela pers. comm.). Watertable mostly high, moisture supply intermittent, fresh.
Exposure: Sheltered situations; light–no shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991). Conservation status elsewhere unknown.

Bracteantha viscosa (Helichrysum viscosum) ASTERACEAE

Sticky Everlasting

Life history

Growth form: Herb to 1 m
Vegetative spread:
Longevity: Usually annual.
Primary juvenile period: Less than 1 year.
Flowers: November–May, peak November.
Fruit/seed: Achene 2 mm long , with pappus of golden bristles; mature February (limited data).
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic ??
Distribution Sydney area: Mainly western Blue Mountains.
Select locations: Liverpool, Lithgow, Bathurst–Sofala, Mullion Range, Hill Top, The Gib.

Habitat

Habitat: Rock crevices on dry slopes.
Altitude: 0–1200 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Woodland, e.g. with *Stypandra glauca*.
Substrate: Rock crevices on dry slopes, volcanic rocks. Soil fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Exposed situations.

Conservation

Conservation: Possibly rare, conservation status unknown.

*Calendula arvensis** ASTERACEAE

Field Marigold

Life history

Growth form: Herb 5–40 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Orange-yellow, November.
Fruit/seed: Achene 1–1.5 mm long, with spines to 5 mm long, no pappus, mature November–January.
Dispersal, establishment & growth: Diaspore: fruit, probably animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean region.
Botanical subregions: CC NT CT CWS NWP SWP SFWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Western Sydney, Orange.
Select locations: Smithfield (1919), Seven Hills (1920), South Orange (1975).

Habitat

Habitat: Weed of orchards.
Altitude: 0–1000 m **Annual rainfall:** 800–1000 mm

Typical local abundance:
Vegetation: Orchards.
Substrate:
Exposure:

Conservation

Conservation: Uncommon weed.

Calendula officinalis * ASTERACEAE

Life history

Growth form: Herb 15–50 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, May–Dec.
Fruit/seed: Achene 2.5 mm long, no pappus (150 seeds per gram).
Dispersal, establishment & growth: Diaspore: achene, no dormancy.
Fire response: Probably killed.
Interaction with other organisms: Susceptible to Calendula Rust (Rowell 1970).

Distribution

Status/origin: Naturalised exotic, native to Mediterranean. Introduced as a garden plant.
Botanical subregions: CT ?SC NWS; Tas., S.A.
Distribution Sydney area: Orange.
Select locations: Orange (1936, 1983).

Habitat

Habitat: Roadside, orchards.
Altitude: 600–1000 m **Annual rainfall:** 1000 mm
Typical local abundance: Frequent.
Vegetation: Roadside, orchards.
Substrate:
Exposure:

Conservation

Conservation: Garden escapes in Orange area; possibly naturalised in Nowra area.

Calendula palaestina * ASTERACEAE

Palestine Marigold

Life history

Growth form: Herb 20–40 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Light yellow, spring.
Fruit/seed: Achene 2.5–4 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean region.
Botanical subregions: CT SWP.
Distribution Sydney area: CT (Harden 1992).
Select locations: No herbarium records.

Habitat

Habitat: Moist sites.
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:

Substrate:
Exposure:

Conservation

Conservation: Rarely naturalised (Harden 1992).

Calocephalus citreus **ASTERACEAE**

Lemon Beauty-heads

Life history

Growth form: Herb, erect from tufted base, 15–60 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Bright golden yellow, late spring–autumn (Harden 1992).
Fruit/seed: Achene 0.7–0.9 mm long, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT ST CWS SWS SWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Probably in western part of the area.
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance: Rarely abundant (Harden 1992).
Vegetation: Grassland or woodland (Harden 1992).
Substrate: Clay or loam soils (Harden 1992). Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Status unknown.

Calomeria amaranthoides (Humea elegans) **ASTERACEAE**

Incense Plant

Life history

Growth form: Quick-growing herb to 2 m high, with woolly stem and sticky, aromatic leaves.
Vegetative spread: No.
Longevity: 2 years
Primary juvenile period:
Flowers: December–April, insect-pollinated?
Fruit/seed: Achene, no pappus, mature March–April.
Dispersal, establishment & growth: Diaspore: fruit, ? limited local dispersal, water-dispersed? Growth rate quick. Coloniser.
Fire response: Probably killed, recruitment from ? soil-stored seed, grows vigorously after fire.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT; Vic.
Distribution Sydney area: Blue Mountains, Hawkesbury River (rare).
Select locations: Rhodes (1888), Penshurst (1894), Loftus, Minto, Douglas Park, Mt Keira, Burragorang Valley, Berambing, Mt Tomah, Mt Wilson, Wingello.

Habitat

Habitat: River flats, creekbanks, gullies, roadsides.

Altitude: 0–800 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Rainforest or margins,, e.g. with *Doryphora–Ceratopetalum*. Moist eucalypt forest,, e.g. with *Eucalyptus fastigata, E. blaxlandii, E. cypellocarpa*.
Substrate: Sandy alluvial soils, sandstone, shale and basalt, fertile–very fertile, well-drained.
Exposure: Light–mid shade

Conservation

Conservation: Probably poorly conserved. Vulnerable in Western Sydney (Benson & McDougall 1991). Status elsewhere unknown.

Calotis cuneifolia ASTERACEAE

Purple Burr-daisy

Life history

Growth form: Erect, sometimes prostrate, herb to 60 cm high.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: White or lilac, August–May, peak September–October.
Fruit/seed: Achene, flattened, 1–2 mm long, surmounted by 2 erect barbed spines 1–4 mm long, forming a burr. Mature October–May.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed. In western NSW, growth commences from seed or recommences from old plants in autumn and provided soil moisture is available plants grow well into summer (Cunningham et al. 1981).
Fire response: Probably killed.
Interaction with other organisms: Grazed by stock (Cunningham et al. 1981).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., N.T., S.A.
Distribution Sydney area: Western Sydney, Blue Mountains.
Select locations: Hornsby, Rookwood, Chester Hill, Marsden Park, Berkshire Park, St Marys, Nortons Basin, Lapstone, Warrimoo, Blackheath, Clarence.

Habitat

Habitat: Woodland.
Altitude: 0–1300 m **Annual rainfall:** 600–1200 mm
Typical local abundance: Occasional–frequent.
Vegetation: Eucalypt woodland with *Melaleuca nodosa* understory or *Melaleuca* scrub.
Substrate: Clay soils from Wianamatta Shale, also Tertiary alluvium and occasionally on sandstone, moderate fertility. Watertable mostly low.
Exposure:

Conservation

Conservation: Inadequate, most habitat is under threat.

Calotis dentex ASTERACEAE

White Daisy Burr

Life history

Growth form: Hairy herb to 80 cm high.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, conspicuous, November–April.
Fruit/seed: Achene 2 mm long, with barbed awns 4–6 mm long, forming a burr. Matures December–April.
Dispersal, establishment & growth: Diaspore: fruit, probably animal-dispersed.

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT NWS; Qld.
Distribution Sydney area: Mainly along Nepean (sporadically from Bargo–Richmond) and Georges River (Glenfield, East Hills) with some outlying populations.
Select locations: Howes Valley, Richmond, Ingleburn, Homebush, Glenfield, Picton, Bargo, Yerranderie, Fitzroy Falls, Albion Park, Meryla.

Habitat

Habitat: Creek banks, lower hillslopes.
Altitude: 0–600 m **Annual rainfall:** 600–1400 mm
Typical local abundance: Occasional–frequent.
Vegetation: Forests and grassy woodlands,, e.g. with dense *Bursaria* thicket.
Substrate: Loamy soils, moderate to high fertility alluvium or adjacent hill sides on sandstone and shale, possibly needs good soils for initial establishment and growth.
Exposure: Mid–light shade.

Conservation

Conservation: Inadequately conserved, now rare in Sydney area. Vulnerable in Western Sydney (Benson & McDougall 1991). Meryla — southern limit.

Calotis glandulosa

ASTERACEAE

Life history

Growth form: Herb to 30 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White–blue, December–February.
Fruit/seed: Achene 1–2 mm long, with barbed awns 1–5 mm long, forming burr.
Dispersal, establishment & growth: Diaspore: fruit, probably animal dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: SC CT ST CWS.
Distribution Sydney area: Only record is Duckmaloi (1935).
Select locations: Duckmaloi (1935).

Habitat

Habitat:
Altitude: 1100 m **Annual rainfall:** 900 mm
Typical local abundance: Very rare.
Vegetation: Grasslands and open-forest.
Substrate:
Exposure:

Conservation

Conservation: Rare.

Calotis hispidula

ASTERACEAE

Bogan Flea

Life history

Growth form: Prostrate or ascending herb with small yellow flowers, to 25 cm high, sometimes forming a dense mat.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period:

Flowers: Yellow, August (October).
Fruit/seed: Achene 1–2 mm long, with barbed awns 1.5–2.5 mm long, forming burr. Mature August–October.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed (e.g. clothing, wool). In western NSW, a cool season annual, mainly growing on floodplains after floodwaters have receded, or following heavy winter rains (Cunningham et al. 1981).
Fire response:
Interaction with other organisms: Palatable to stock during early growth.

Distribution

Status/origin: Native.
Botanical subregions: NC CC NWS CWS SWS NWP SWP NFWP SFWP; mainland States.
Distribution Sydney area: Western Sydney.
Select locations: Cowan (1921), Parramatta (1887), Flemington, Richmond (1910), Blacktown (1910), Bringelly (1912).

Habitat

Habitat: Dry situations. Recorded beside railways, saleyards, in lawns.
Altitude: 0–200 m **Annual rainfall:** 600–1100 mm
Typical local abundance: Occasional.
Vegetation: Grasslands, open-forests, roadsides.
Substrate: Probably well drained clay soils. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: A rare species, not conserved.

Calotis lappulacea ASTERACEAE

Yellow Burr-daisy

Life history

Growth form: Much-branched, hairy herb to 50 cm high with yellow flowers.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, throughout the year.
Fruit/seed: Achene 1–1.5 mm long, with barbed awns forming burr with bristles, developed soon after flowering.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Southern Cumberland Plain and lower Blue Mountains.
Select locations: Howes Valley, Epping, Richmond, Bankstown, Glenfield, Bringelly, Camden, Lapstone, Silverdale, Jenolan River, Abercrombie Caves, Goodmans Ford.

Habitat

Habitat:
Altitude: 0–500 m **Annual rainfall:** above 600 mm
Typical local abundance: Occasional–frequent.
Vegetation: Grassy woodland, e.g with *Eucalyptus moluccana*, *E. melliodora*, *E. albens*.
Substrate: Heavy clay soils from Wianamatta Shale or Devonian Lambie Group. Fertile soil. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: No shade–light shade.

Conservation

Conservation: Inadequately conserved, becoming rare in Sydney area. Vulnerable in Western Sydney (Benson & McDougall 1991). 60 % (24/38) Herbarium specimens collected pre. 1960.

Calotis scabiosifolia var. *integrifolia*

ASTERACEAE

Rough Burr-daisy

Life history

Growth form: Hairy herb to 40 cm high.
Vegetative spread: Spreads by stolons.
Longevity: Indefinite.
Primary juvenile period:
Flowers: White–mauve, October–February.
Fruit/seed: Achene, flattened, 3–4 mm long with 5–6 rigid spines 1–4 mm long.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed. In western NSW plants dry off during summer, but may persist in favourable situations (Cunningham et al. 1891).
Fire response:
Interaction with other organisms: Grazed by stock.

Distribution

Status/origin: Native.
Botanical subregions: CT ST SWS SWP; Vic.
Distribution Sydney area: Bathurst–Orange, Wingello.
Select locations: Known only from old specimens, Wallerawang (1899), Wingello (1913), Orange (1907).

Habitat

Habitat:
Altitude: 600–1100 m **Annual rainfall:** 900–1200 mm
Typical local abundance:
Vegetation: Open woodland and grassland.
Substrate: Probably clay soils.
Exposure:

Conservation

Conservation: Possibly locally extinct, only known from old records.

Calotis scapigera

ASTERACEAE

Tufted Burr-daisy

Life history

Growth form: Herb to 35 cm high.
Vegetative spread: Spreads by stolons to form clumps, sometimes 1 m or more across.
Longevity: Indefinite.
Primary juvenile period:
Flowers: White–lavender, throughout the year.
Fruit/seed: Achene, flattened, about 2 mm long with 4–6 rigid spreading spines 1–4 mm long.
Dispersal, establishment & growth: Diaspore: fruit, animal-dispersed. In western NSW growth occurs at most times of year, but plants may die back during summer–autumn (Cunningham 1981).
Fire response:
Interaction with other organisms: Grazed by stock.

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT NWS CWS SWS NWP SWP; Qld, Vic., S.A.
Distribution Sydney area: Only known from Concord, possibly chance introduction by stock [West Maitland (1908) outside area].
Select locations: Concord (W. Woolls probably 1860s).

Habitat

Habitat:
Altitude: 0–50 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation:
Substrate: Heavy soils, moist places.
Exposure:

Conservation

Conservation: Locally extinct.

Carduus nutans subsp. *nutans* * ASTERACEAE

Nodding Thistle

Life history

Growth form: Herb to 70 cm high with rosettes that often exceed 1 m, and a strong, fleshy taproot (Medd 1984).
Vegetative spread: No, but plants can re-grow from old rootstock (Medd 1984).

Longevity: 2 years. Interference with normal development,, e.g. grazing or spraying, causes the plant to behave as a short-lived perennial (Doing et al. 1969).
Primary juvenile period: 1–2 years depending on emergence relative to winter (Medd 1984).
Flowers: Mauve–red, spring–autumn, but regrowth from old rootstock can flower in winter (Medd 1984). Cold temperatures required to initiate flowering (Doing et al. 1969).
Fruit/seed: Achene 4–5 mm long, with pappus of bristles 15–20 mm long. 250–400 fresh, well-developed seeds per. gram (Doing et al. 1969).

Dispersal, establishment & growth: Diaspore: fruit. Short-distance wind-dispersal from parent plant, long-distance dispersal in fodder, movement of vehicles and stock (Medd 1984). Most fresh seeds germinate 14 days after sowing (Doing et al. 1969). Seed germination strongly stimulated by light, suppressed by green pasture cover; short period of innate dormancy in addition to dormancy induced by soil cover allows seed to survive in soil for up to 20 years (Popay 1987). Seedlings emerge in autumn and spring forming rosettes, but require several weeks of low winter temperature to initiate stems for flowering (Medd 1984).
Fire response:
Interaction with other organisms: Aggressive competitor of pastures (Medd 1984). Thistle-head Weevil *Rhinocyllus conicus* and Seed-head Fly *Urophora solstitialis* recently introduced for biological control, successfully limiting seed production (CSIRO Department of Entomology, no date).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia , N. Africa. Recorded in eastern Australia in late 1940s (Medd 1984), establishment over present range marked by unusual sequence of wet years 1950–1961 (Doing et al. 1969).
Botanical subregions: NT CT ST NWS CWS SWS; Vic., Tas., S.A., W.A.
Distribution Sydney area: Oberon area.
Select locations: Black Springs (1950, only Herbarium record).

Habitat

Habitat: Cultivated paddocks, sometimes roadsides and riverbanks (Doing et al. 1969).
Altitude: 1000 m **Annual rainfall:** 800 mm
Typical local abundance:
Vegetation: Thistle communities in cultivated pastures, roadside and riverbank vegetation mainly with *Cirsium vulgare, Onopordum acanthium, Carduus tenuiflorus, C. pycnocephalus, Silybum marianum* (Doing et al. 1969).
Substrate: Agricultural soils, fertile. Moist climate and basalt soils (Doing et al. 1969).
Exposure:

Conservation

Conservation: Proclaimed noxious weed in NSW (Medd 1984). Control can be achieved preventing seed germination by maintaining vegetation cover (Popay 1987).

Carduus pycnocephalus * ASTERACEAE

Slender Thistle

Life history

Growth form: Herb to 80 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Purple-pink, October–November.
Fruit/seed: Achene 4–5 mm long, with pappus of bristles 10–14 mm long, mature November–December.
Dispersal, establishment & growth: Diaspore: fruit. Animal, water and wind-dispersed (Carr et al. 1992).

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC CT ST NWS CWS SWS NWP SWP; Qld, Vic.,Tas., W.A.
Distribution Sydney area: Western Sydney and Bathurst area.
Select locations: Richmond, Liverpool (1909), Mt Annan, Bowral, Bathurst.

Habitat

Habitat: Pastures, roadsides, wastelands and cultivation.
Altitude: 0–1000 m **Annual rainfall:** 700–1200 mm
Typical local abundance: Occasional.
Vegetation:
Substrate: Clay soil from shales, basalt.
Exposure:

Conservation

Conservation: Weed of pastures roadsides, wastelands and cultivation.

Carduus tenuiflorus * (Carduus pycnocephalus) ASTERACEAE

Winged Slender Thistle

Life history

Growth form: Herb 50–150 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Purple, October–November.
Fruit/seed: Achene 4–5 mm long, with pappus of bristles 11–13 mm long.
Dispersal, establishment & growth: Diaspore: fruit. Animal, water and wind-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC SC NT CT ST NWS CWS SWS NWP SWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Bathurst area.
Select locations: Flemington Saleyards (1968), Tarana (1962).

Habitat

Habitat: Weed of pastures, roadsides, wasteland and cultivation.
Altitude: 0–1000 m **Annual rainfall:** 1000 mm
Typical local abundance: Occasional–frequent.
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Weed of pastures, roadsides, wasteland and cultivation.

Carthamus lanatus * ASTERACEAE

Saffron Thistle

Life history

Growth form: Herb to 1 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow–cream with dark veins, late spring–early summer.
Fruit/seed: Achene 5–6 mm long, with pappus of stiff bristles 7–10 mm long.
Dispersal, establishment & growth: Diaspore: fruit. Animal, water and wind-dispersed (Carr et al. 1992), and as a contaminant in grain, hay and wool. Germinates autumn–early

winter (Parsons 1973). Rosettes form in late spring and erect growth in October. Germinates within 2 years but dormancy can last up to 8 years, most seed that germinates lies in the top 5 cm of soil (Gorham 1986).
Fire response:
Interaction with other organisms: Food plant of Pacific Black Duck *Anas superciliosa*, Grey Teal *Anas gibberifrons* (Barker & Vestjens 1989,1990). Flowers and seed eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe, first naturalised in Australia in 1887 (Gorham 1986).
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Mainly western Sydney.
Select locations: Ashfield, Oakville, Penrith, Casula, Campbelltown, Jamberoo, Barralier, Bathurst (1904).

Habitat

Habitat: Wasteland.
Altitude: 0–1500 m **Annual rainfall:** more than 700 mm
Typical local abundance: Frequent.
Vegetation: Cultivated paddocks.
Substrate: Overgrazed paddocks with poor fertility and poor soil structure resulting from too-frequent cropping. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Its prickly nature restricts stock grazing and reduces carrying capacity. Recognised as weed by Department of Agriculture in 1854 (Gorham 1986). A declared noxious weed in some shires (Harden 1992)

Carthamus tinctorius * ASTERACEAE

Safflower

Life history

Growth form: Herb to 60 cm high. Erect, woody-stemmed, 60–120 cm high with strong taproot to 2 m deep (Colton 1988).
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Red, orange, yellow, white, winter–summer. Abundant pollen and nectar, attracts bees but the flowers are mostly self-pollinated; individual flowers open for 2–3 days, plants flower 2–3 weeks (Colton 1988).
Fruit/seed: Achene 7–8 mm long, pappus absent or minute, matures December–January. Each flower head can produce up to 100 seeds but more commonly 25–50 (Colton 1988). Sharp spines on leaves and bracts of some forms deter predators, e.g. kangaroos (Colton 1988).
Dispersal, establishment & growth: Diaspore: fruit. Winter–spring growing, no seed dormancy; development influenced by temperature, early growth slow, several weeks in rosette stage (Colton 1988).
Fire response:
Interaction with other organisms: Predators include Cutworm caterpillars, green peach aphids, plum aphids (Colton 1988).

Distribution

Status/origin: Exotic, native to Europe. Cultivated in Australia since 1950s as a dryland crop for its oil-yielding seeds; grown for centuries in China, India, the Near East and N Africa mainly for red dye, carthamin, which was extracted from dried and ground petals; widely used to colour food and clothing (Colton 1988).
Botanical subregions: CC CWS SWS SWP NFWP; Qld, Vic., Tas., W.A.
Distribution Sydney area: Glenfield (1967).

Select locations: Glenfield only record for area.

Habitat

Habitat: Roadsides, railway line.
Altitude: 0–50 m **Annual rainfall:** 800 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Grows best on neutral–alkaline soil, with good drainage, does not tolerate water-logging; tolerates salinity (Colton 1988).
Exposure:

Conservation

Conservation: Not likely to be naturalised, localised establishment from spilt grain.

Cassinia aculeata ASTERACEAE

Dolly Bush

Life history

Growth form: Shrub 1-2.5 m high, with rusty hairs on stem.
Vegetative spread: No.
Longevity: Plants up to ? 36 years old (Lion Is) but no re-establishment in absence of fire or disturbance.
Primary juvenile period:
Flowers: November–March.
Fruit/seed: Achene 0.8 mm long, pappus 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Killed by high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.). No seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms: Contact with flowering plant causes dermatitis and eye irritation in humans (Hurst 1942).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT ST CWS SWS SWP; Vic., S.A., Tas.
Distribution Sydney area: Coast and Mountains.
Select locations: Budgewoi, Woy Woy, Berowra, Como, Menangle, Kurrajong Heights, Woodford, Mt Victoria, Clarence, Kanangra, Hilltop, Bundanoon.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Sclerophyll forest, woodland and heath.
Substrate: Variable, sandy or gravelly soil from sandstone, shale, basalt, fertile–infertile, well-drained.
Exposure: Mid-shade–full sun.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Cassinia arcuata ASTERACEAE

Sifton Bush, Chinese Shrub

Life history

Growth form: Shrub up to 2 m high, with short taproot and numerous stout lateral roots to 30 cm deep (Parsons & Cuthbertson 1992).
Vegetative spread: No.
Longevity: Probably 10–20 years.
Primary juvenile period: 2–3 years (Parsons & Cuthbertson 1992).
Flowers: March–April.
Fruit/seed: Achene, 0.8 mm long with pappus of bristles 2 mm long, mature March–April.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Germination in winter. Non-dormant fraction 60-80 % at 1 year old, 0.3 % at 15 years. Coloniser of bare

sites. Seedlings established on soil surface, and reached 60 mm in height after 3 months. May reach 600 mm in the first year in favourable sites. Seedlings are unpalatable to stock. Plants reach 2 m in height in 5–10 years (Campbell et al. 1990) (McGowen et al. 1990). Drought-resistant.
Fire response: Plants killed, followed by seedling recruitment.
Interaction with other organisms: Unpalatable to stock and may compete with pasture species. 'Chinese Shrub' originates from its use as roofing material by Chinese on the Victorian Goldfields in the 1850s (Parsons 1973).

Distribution

Status/origin: Native.
Botanical subregions: CC CT ST NWS CWS SWS NWP SWP SFWP; Vic., S.A., W.A.
Distribution Sydney area: Mainly west of area, Bathurst–Orange — though early records for Wyong and Homebush suggest that it is indigenous to some coastal areas.
Select locations: Wyong (1900), Marayong, Duck River, Homebush (1894), Wolgan Gap, Bathurst, Ophir, Mullions Range.

Habitat

Habitat: Coloniser of bare sites, in woodland, along roadsides, overgrazed pastures.
Altitude: 0–1000 m **Annual rainfall:** 600–1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalyptus woodland, e.g. *Eucalyptus macrorhyncha, E. melliodora*, mid-stratum.

Substrate: Low-nutrient soils on sandstone. Acid stony soils, on quartzite, shale; infertile. Watertable permanently low, moisture supply intermittent, fresh. Seedling growth depressed by lime (Campbell et al. 1990). Recorded on saline sites in western NSW (Semple 1993).
Exposure: Exposed–indifferent; light–no shade.

Conservation

Conservation: A native species reported to have expanded as a result of pasture deterioration after the 1982 drought (Campbell et al. 1990). Vulnerable in Western Sydney (Benson & McDougall 1991). A natural coloniser of disturbed sites such as mine dumps.

Cassinia aureonitens ASTERACEAE

Life history

Growth form: Shrub 2-3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Cream–yellow, November–March, peak November–December.
Fruit/seed: Achene 0.5 mm long, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT.
Distribution Sydney area: Coast and Mountains.
Select locations: Wollombi, Wisemans Ferry, Mooney Mooney Creek, Cheltenham, Cooks River, Kurrajong Heights, Mt Wilson, Yerranderie, Thirlmere, Albion Park.

Habitat

Habitat: Forest and woodland on hillsides and gullies.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Mid-stratum, forest and woodland, e.g. with *Eucalyptus sclerophylla, E. piperita, E. quadrangulata*, with shrubby understorey, rarely in heath.
Substrate: Sandstone, shale, basalt, fertile–infertile. Watertable mostly low, moisture supply intermittent, non-saline.
Exposure: Sheltered sites, mid-shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Cassinia compacta ASTERACEAE

Life history

Growth form: Woody shrub 2–3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow, spring–summer.
Fruit/seed: Achene 0.5 mm long, pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT CWS; Qld.
Distribution Sydney area: Mainly coast, localised.
Select locations: Colo Heights, Mt White, Cowan Creek, Lithgow, Fitzroy Falls.

Habitat

Habitat: Steep sheltered slopes.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation: Mid-stratum, eucalypt forest, edge of rainforest.
Substrate: Sandstone with shale influence, infertile soil. Watertable mostly low, moisture supply intermittent.
Exposure: Sheltered sites, mid-shade.

Conservation

Conservation: Uncommon, southern limit Fitzroy Falls.

Cassinia cunninghamii ASTERACEAE

Life history

Growth form: Shrub to 1–1.5 m high, stem woolly with greyish-white hairs. Leaves have a spicy liquorice aroma when crushed (P. Hind pers. comm.).
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: Yellow, December–February.
Fruit/seed: Achene, 0.5 mm long, with pappus of bristles 1.5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Can establish from seed in absence of disturbance possibly due to tolerance of shade and drought (Ladd 1988). Medium growth rate.
Fire response: Killed, established from widely dispersed propagules (Ladd 1988).
Interaction with other organisms: Seed eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT CWS.
Distribution Sydney area: Colo River and north-west of area.
Select locations: Mt Monundilla, Boorai Ridge, Colo Heights, St Albans, Mount Manning, Gospers Mountain, Newnes Plateau.

Habitat

Habitat: Eucalypt open-forest on sandstone.
Altitude: 0–1000 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt open-forest,, e.g. with *Eucalyptus crebra*, *E. punctata*, *E. paniculata* and dry shrubby understorey, e.g. with *Dodonaea triquetra*, *Oxylobium ilicifolium*, *Acacia terminalis*.

Substrate: Sandstone with shale influence. Intolerant of waterlogging.
Exposure:

Conservation

Conservation: Conservation status unknown.

Cassinia denticulata ASTERACEAE

Life history

Growth form: Shrub 0.7–2 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Pale yellow–white, October–January.
Fruit/seed: Achene, 0.6 mm long, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Killed by high-intensity fire (1/1994) at Lane Cove, no seedlings seen (P. Kubiak pers. comm.). Flowered in area (at KCNP) burnt 3 years previously.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CT.
Distribution Sydney area: Coast and Blue Mountains.
Select locations: Bucketty, Berowra, St Ives, Bradleys Head, Woronora River, Bulli Pass, Kurrajong Heights, Blackheath, Newnes SF, Hilltop, Fitzroy Falls.

Habitat

Habitat: Hillsides and gullies.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Mid-stratum, forest and heath with shrubby understorey, e.g. with *Eucalyptus gummifera, E. piperita, E. sieberi, E. capitata* or *Angophora costata.*
Substrate: Sandy, infertile soils from sandstone. Watertable mostly low, moisture supply intermittent, non-saline.
Exposure: Sheltered sites.

Conservation

Conservation: Endemic to Sydney area, conservation status unknown.

Cassinia laevis ASTERACEAE

Cough Bush

Life history

Growth form: Shrub to 3 m high with white-woolly stems.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, November–January.
Fruit/seed: Achene 0.8 mm long, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT CT ST NWS CWS SWS NWP SWP NFWP; Qld, S.A.
Distribution Sydney area: Currant Mountain.
Select locations: Currant Mountain (1954).

Habitat

Habitat: Upper slopes.

Altitude: 600 m **Annual rainfall:** 800 mm
Typical local abundance: Frequent.
Vegetation: Mid-stratum.
Substrate: Sandstone, infertile soil .
Exposure:

Conservation

Conservation: Conservation status unknown.

Cassinia leptocephala subsp. *leptocephala* ASTERACEAE

Life history

Growth form: Large robust woody shrub to 3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Pale yellow, October–January.
Fruit/seed: Achene 0.6 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT.
Distribution Sydney area: coast (to coast and Tablelands of N.S.W.).
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare, not well known.

Cassinia longifolia ASTERACEAE

Life history

Growth form: Aromatic sticky shrub 1.2-2.5 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: March–April.
Fruit/seed: Achene 0.8 mm long, with pappus of bristles 2–3 mm long, mature March–April.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Seedlings not recorded within 1 year of fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC CT ST CWS SWS; Vic., Tas.
Distribution Sydney area: Coast, Blue Mountains, Orange.
Select locations: Arncliffe (1893), Penshurst, Royal NP, St Marys, Razorback, Lawson, Mt Tomah, Orange, Mt Canobolas, Cadia, Mt Jellore, Kangaloon (P. Kodela pers. comm.).

Habitat

Habitat:

Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional–rare.
Vegetation: Mid-stratum, eucalypt woodland, e.g. with *Eucalyptus macrorhyncha*, or open-forest to tall open-forest, e.g. *Eucalyptus cypellocarpa*, *E. fastigata*, *E. radiata* (P. Kodela pers. comm.)
Substrate: Shale, basalt, sandstone with calcareous influence, fertile soils. Watertable permanently low, moisture supply intermittent, non-saline.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Cassinia quinquefaria ASTERACEAE

Life history

Growth form: Shrub 1–3 m high, stems olive or yelowish, usually resinous.
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: White, January–May, peak April.
Fruit/seed: Achene 0.8 mm long with pappus of bristles 2 mm long, mature March–August.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms: Tested positive for anti-tumour activity (inhibited sarcoma), no alkaloids (Collins et al. 1990).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic.
Distribution Sydney area: Mostly western parts of the area.
Select locations: Kogarah (1894), Razorback, Mt Annan, Cambewarra, Mt Victoria, Newnes Junction, Capertee, Sofala, Mullion Range, Hilltop, Berrima, Wombeyan Caves.

Habitat

Habitat: Open sites in eucalypt forest and woodlands.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional–rare.
Vegetation: Forests and woodland, e.g. with *Eucalyptus pilularis*, *E. resinifera*, and woodland, e.g. with *Eucalyptus crebra*, *E. tereticornis*.
Substrate: Clay loam on hale, fertile. Intolerant of waterlogging.
Exposure: Open sites.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), but probably conserved elsewhere.

Cassinia species *D* ASTERACEAE

Life history

Growth form: Shrub to 2 m high, stems olive or red with soft hairs, leaves sticky (Harden 1992).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: At any time of year but mainly summer–autumn (Harden 1992).
Fruit/seed: Achene 0.8 mm long, with pappus of bristles 2–2.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT ST NWS CWS SWS.
Distribution Sydney area:
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Sclerophyll forest (Harden 1992).
Substrate: Stony soils (Harden 1992).
Exposure:

Conservation

Conservation: Conservation status unknown.

Cassinia trinerva ASTERACEAE

Life history

Growth form: Shrub or tree to 8 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Creamy-white, summer–autumn.
Fruit/seed: Achene 0.5 mm long, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST CWS; Vic., Tas.
Distribution Sydney area: Southern Highlands and southwest of area.
Select locations: Bulli, Razorback, Burragorang, Robertson (P. Kodela pers. comm.), Kangaroo Valley, Jenolan Caves (1899).

Habitat

Habitat: Moist eucalypt forest, rainforest.
Altitude: 0–900 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Mid stratum in moist eucalypt forest and edge of disturbed rainforest, e.g. with *Eucalyptus quadrangulata*. Mixed cool temperate/warm termperate rainfores, where there are light gaps (P. Kodela pers. comm.)
Substrate: Shale and silty soils; basalt (P. Kodela pers. comm.).
Exposure: Sheltered sites.

Conservation

Conservation: Conservation status unknown.

Cassinia uncata ASTERACEAE

Sticky Cassinia

Life history

Growth form: Sticky shrub 1–3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White–straw-coloured, March.
Fruit/seed: Achene 0.6 mm long, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT ST NWS CWS SWS SWP; Qld,Vic., S.A.
Distribution Sydney area: Coast and north western Sydney.
Select locations: Wamberal, Barrenjoey (L.McD.), Galston, Lindfield, Tempe (1899), Castlereagh SF, Windsor, Maroota.

Habitat

Habitat:
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Open-forest, e.g. with *Eucalyptus piperita, E. eximia, Angophora bakeri* or woodland, e.g. with *Eucalyptus polyanthemos, E. macrorhyncha* (Benson & Keith 1990).
Substrate: Sandstone, shale, Tertiary alluvium. Soil fertile–infertile. Watertable permanently low, moisture supply intermittent, non-saline.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991). Conservation status elsewhere unknown.

Celmisia longifolia species complex ASTERACEAE

Snow Daisy

Life history

Growth form: Herb with dense-tufted basal stock.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Florets pink or white, February.
Fruit/seed: Achene c. 5 mm long with pappus of barbellate bristles, February.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST.
Distribution Sydney area: Upper Blue Mountains, mainly Newnes Plateau.
Select locations: Blackheath, Newnes State Forest.

Habitat

Habitat: Swamp and seepage areas, moist cliff faces.
Altitude: 1000–1200 m **Annual rainfall:** 1000 mm
Typical local abundance: Frequent.
Vegetation: Newnes Plateau shrub-swamps or less commonly Blue Mountains sedge swamps, e.g. with *Gymnoshoenus sphaerocephalus, Baeckea linifolia, Grevillea acanthifolia, Gleichenia.*
Substrate: Often on margins of poorly-drained, peaty swamps, infertile. Watertable permanently high.
Exposure: Full sun.

Conservation

Conservation: Restricted, probably inadequately conserved. Habitat vulnerable to disturbance.

Centaurea calcitrapa * ASTERACEAE

Star Thistle

Life history

Growth form: Erect herb with radical leaves.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:

Flowers: Florets pale purple or pink, spring–summer.
Fruit/seed: Achene 3 mm long, no pappus.
Dispersal, establishment & growth: Diaspore: fruit, animal and water-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Africa and Asia.
Botanical subregions: NC **CC** NT **CT** ST NWS CWS SWS SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread but rare.
Select locations: Haberfield (1920), Penrith (1912), Lithgow (1967).

Habitat

Habitat: Wasteland.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Grassland.
Substrate: Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: A declared noxious weed in many NSW shires (Harden 1992), but rare in Sydney area.

Centaurea melitensis * ASTERACEAE

Maltese Cockspur, Cockspur Thistle

Life history

Growth form: Herb to 1 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, mainly spring–summer. Very late September–October (Price).
Fruit/seed: Achene 2.5 mm long, pappus of bristles 2.5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, animal and water-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC **CC** SC NT **CT** ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Woy Woy, Penshurst, Cooks River, Richmond, The Oaks, Jenolan Caves, O'Connell, Bullio, Exeter, Wingello (1899).

Habitat

Habitat: Disturbed areas, pastures, roadsides, stock routes and cultivated land.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation:
Substrate: Gravel pits, poultry yards.
Exposure:

Conservation

Conservation: Weed of disturbed areas with most Herbarium records collected 1900–1930.

Centaurea solstitialis * ASTERACEAE

St Barnaby's Thistle

Life history

Growth form: Herb to 1 m high.

Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, late spring–summer (Parsons 1973).
Fruit/seed: Achene 2.5 mm long — two kinds: one with pappus of bristles to 5 mm long, suitable for wind-dispersal, the other with or without reduced pappus; spread by water and as contaminant of agricultural produce, vehicles, wool, fodder (Parsons 1973).

Dispersal, establishment & growth: Diaspore: fruit, wind, water-dispersed, human-dispersed. Germinates in autumn, remaining a rosette during winter and developing quickly to diameter of 30 cm as temperature rises in spring. Flowering commences in November and continues through summer, 'seeds' formed over long period of 4–5 months (Parsons 1973).
Fire response:
Interaction with other organisms: Spines on flower-heads deter grazing by sheep (Parsons 1973).

Distribution

Status/origin: Naturalised exotic, native to Europe, W Asia.
Botanical subregions: CC SC NT CT ST NWS CWS SWS NWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread but sporadic.
Select locations: Denistone, Flemington Saleyards, Richmond, Bathurst (1904).

Habitat

Habitat: Weed of disturbed sites, pastures and cultivated land.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation: Pastures and cultivated lands.
Substrate: Pasture soils.
Exposure:

Conservation

Conservation: Naturalised weed, widespread but sporadic, in pastures and cultivated land. Declared noxious in some NSW shires.

Centipeda cunninghamii ASTERACEAE

Common Sneeze Weed

Life history

Growth form: Herb c. 20 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Summer.
Fruit/seed: Achene 2 mm long, no pappus.
Dispersal, establishment & growth: Diaspore: fruit, leaf growth and flowering occurs mainly in the warmer months, with plants remaining semi-dormant in winter (Cunningham et al. 1981).
Fire response:
Interaction with other organisms: Sparingly grazed by stock, possibly strongly aromatic. Odour emitted by plants when crushed deters grazing; powdered leaves are said to act like snuff, hence common name (Cunningham et al. 1981).

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A., N.Z.
Distribution Sydney area: Coast, west of mountains.
Select locations: Pennant Hills, Windsor, Glenfield, Shoalhaven River, Capertee, Rydal (1897), Winburndale, Hilltop.

Habitat

Habitat: Wet places, river flats.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance:

Vegetation:
Substrate: Alluvial soil, damp areas subject to flooding.
Exposure: Full sun.

Conservation

Conservation: Conservation status unknown.

Centipeda minima var. ***minima*** ASTERACEAE

Spreading Sneeze Weed

Life history

Growth form: Small aromatic herb.
Vegetative spread: No.
Longevity: Short-lived, 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Small yellow flowers, January–February.
Fruit/seed: Achene 2 mm long, pappus absent, January–April.
Dispersal, establishment & growth: Diaspore: fruit, possibly water-dispersed. Coloniser.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS SWS NWP SWP NFWP; Qld, Vic., Tas., N.T., S.A., W.A., N.Z., Asia to Afghanistan.
Distribution Sydney area: Widespread.
Select locations: Hornsby, Devlins Creek, Glenfield, Elderslie, Cambewarra, Colo River, Yarramundi, Thirlmere Lakes, Coxs River, Berrima.

Habitat

Habitat: Floodplain wetlands, lagoon edges.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare–frequent.
Vegetation: Herbland, e.g. with *Persicaria lapathifolia, Xanthium chinense.*
Substrate: Mainly clay and alluvium, fertile soil, watertable mostly high.
Exposure: Full sun.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991). Status elsewhere unknown.

***Chondrilla juncea* *** ASTERACEAE

Skeleton Weed

Life history

Growth form: Herb 0.5–1 m high, with long taproot to depth of 3 m (Parsons 1973), purplish radical leaves until stem develops, then almost leafless.

Vegetative spread: Local spread by cultivation, regrowth from taproot can occur from depth of more than 1 m; cutting of taproot stimulates growth of new rosettes at almost any time of year (Parsons 1973).
Longevity: Biennial–perennial.

Primary juvenile period: Less than 1 year, although on poor soils flowering sometimes does not occur in the first year (Parsons 1973).
Flowers: Yellow, summer (January–April).
Fruit/seed: Achene 8–10 mm long, with stalked pappus of toothed bristles 6–7 mm long, mature January–April. Seed production is prolific, one plant can produce15,000 seeds in a season, with up to 90% germination depending on conditions; high summer temperature results in maximum seed production; seed is relatively short-lived, less than 3 years (Parsons 1973).
Dispersal, establishment & growth: Diaspore: fruit. Animal, water, vegetative, and wind dispersed (Carr et al. 1992). Germinates after autumn rains, rosettes form and grow slowly

over winter while the taproot develops rapidly (more than 1 cm/day), each taproot produces 2–3 rosettes, stem is produced in spring and rosette leaves die leaving the plant almost leafless; seedlings sensitive to competition, particularly for light (Parsons 1973).
Fire response:
Interaction with other organisms: Troublesome weed to wheat-growers, tough wiry stems have prevented harvesting of wheat and forced changes in farming practice; rosettes grazed by sheep (Parsons 1973).

Distribution

Status/origin: Naturalised exotic, native to Europe and W. Asia. First recorded in Australia near Wagga in 1917, probably introduced in vine stocks from southern Europe (Parsons 1973).
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP SFWP; Qld, Vic., S.A., W.A.
Distribution Sydney area: Widespread but mainly western part of the area.
Select locations: Emu Plains, Grose River, Albion Park, Goodmans Ford, Menangle Park, Linden, Lithgow, Bathurst, Orange (1935).

Habitat

Habitat: Creekbanks.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation: Open plant communities (Parsons 1973). On creekbanks with *Sigesbeckia, Persicaria, Solanum.*
Substrate: Deep, light-textured soils needed for development of long taproot; requires moderate calcium and phosporous levels; can withstand long periods of drought (Parsons 1973).
Exposure: Exposed, full sun.

Conservation

Conservation: Declared noxious weed in several States and part of NSW. Not invasive of bushland.

Chrysanthemoides monilifera subsp. *rotundata** ASTERACEAE

Bitou Bush

Life history

Growth form: Large sprawling shrub to 1.5 m high with extensive tap and lateral root system, more aggressive than C. subsp. *monilifera*, more extensive root system and more difficult to control (Parsons & Cuthbertson).

Vegetative spread: Arching branches root vigorously where they touch the sandy substrate (R. Buchanan pers. comm.), regrows from cut stump (Dellow 1988).
Longevity: About 7–8 years.
Primary juvenile period: Primary juvenile period about 2 years.
Flowers: Yellow, May–July, but intermittent all year.
Fruit/seed: Fleshy berry 6–8 mm diam., black when ripe, mature mainly June–August.

Dispersal, establishment & growth: Diaspore: black fleshy 1-seeded fruit, mature in summer, mainly bird-dispersed, also spread in faeces of rabbits, foxes and cattle; ants eats fleshy skins and discard the seeds; spread in contaminated gravel in Victoria; fruit and seeds dispersed by running water; soil-stored seed up to 9500/m^2; 60% viability, some dormant for at least 10 years (Parsons & Cuthbertson 1992). Seeds germinate at any time of year but mostly autumn. Most seeds retain viability for at least 2 years with some up to 4 years (Dellow 1988).
Fire response: Mature plants resprout after fire (Dellow 1988). Generally resprouts strongly after fire; dense growth of seedlings can crowd out other plant species (Parsons & Cuthbertson 1992).
Interaction with other organisms: Leaf litter and fruit leachates inhibit the germination and growth of some native plant species; can form dense stands, replacing native species thus destroying habitat of native birds and animals (Parsons & Cuthbertson 1992). Eliminated when grazed or trampled by livestock — is not a problem on agricultural land (Dellow 1988). Flower and fruit production reduced 50% and 70% by introduction of Bitou Tip Moth *Comostolopsis germana* in1990 (Tanner & Nolan 1993).

Distribution

Status/origin: Naturalised exotic, native of S. Africa. Introduced in mid 19th century, being dispersed in ships' ballast dumped on the Hunter River banks 1908 (Parsons & Cuthbertson 1992).
Botanical subregions: NC CC SC; LHI, Qld.
Distribution Sydney area: Coastal beaches and north of Sydney.
Select locations: Palm Beach, La Perouse, Port Kembla (1965), Shellharbour.

Habitat

Habitat: Sand dunes and forest margins near beaches.
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent–dominant.
Vegetation: Sand dune vegetation, e.g. with *Leptospermum laevigatum, Acacia longifolia, Correa alba.*
Substrate: Sand dunes and sand-mined areas, infertile, well-drained. Can withstand dry conditions; coloniser of sand dunes where it competes successfully with native species (Dellow 1988).
Exposure: Full sun.

Conservation

Conservation: Used as a secondary stabilising species on sand drift and mined areas in 1946–1968 but use stopped in 1971; poses a threat to native sand dune vegetation and drastically alters habitat for wildlife. Estimated to occur along 60% of the NSW coast including 12 national parks and 9 nature reserves (Parsons & Cuthbertson 1992), does not persist in cultivated areas (Dellow 1988). Selective aerial spraying techniques that do not kill native species are being developed by John Toth, Dept. of Agriculture, Biological and Chemical Research Institute, Rydalmere. Spray in winter, very low rate (M. Clarke pers. comm.).

Chrysanthemoides monilifera subsp. *monilifera* * ASTERACEAE

Boneseed

Life history

Growth form: Upright shrub to 3 m high; shallow rooted, no distinct tap root (Parsons 1973).
Vegetative spread: Regrows strongly from cut stumps (Parsons 1973).
Longevity: About 7–8 years.
Primary juvenile period: More than 18 months (Parsons 1973).
Flowers: Yellow, August–December.
Fruit/seed: Fleshy berry 6–8 mm diam., black when ripe; mature in summer (Parsons & Cuthbertson 1992).
Dispersal, establishment & growth: Diaspore: black fleshy 1-seeded fruit, mainly bird-dispersed, also spread in faeces of rabbits, foxes and cattle; ants eats fleshy skins and discard the seeds; spread in contaminated gravel in Victoria; fruit and seeds dispersed by running water (Parsons & Cuthbertson 1992). Fruit reported sold as pea-shooter amunition (Parsons 1973). Seed moved in soil during roadworks (R. Buchanan pers. comm.). Large soil-stored seedbank, up to 2500/m2 (Parsons & Cuthbertson 1992). Seeds germinate at any time of year but mostly autumn; most seeds retain viability for at least 2 years and up to 4–5 years (Dellow 1988), viability increased with increased depth of burial (Parsons & Cuthbertson 1992). Seed quickly germinates after mature plants are removed.

Fire response: Killed by high-intensity fire (1/1994) at Lane Cove, seedlings observed (P. Kubiak pers. comm.). Mature plants killed by fire in Victoria with almost complete germination of weathered seed (Dellow 1988).

Interaction with other organisms: Leaf litter and fruit leachates inhibit the germination and growth of some native plant species; can form dense stands, replacing native species and destroying habitat of native birds and animals (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to S Africa. Introduced as an ornamental in 1850s, considered naturalised by 1910 (Parsons & Cuthbertson 1992).
Botanical subregions: CC SC CT NFWP SFWP; Vic., Tas., S.A., W.A.

Distribution Sydney area: Coast, western Sydney.
Select locations: Mt Colah (R. Buchanan pers. comm.), Beecroft, Chatswood, Royal Botanic Gardens (1898), Heathcote, Shellharbour, Macquarie Fields, Wallacia, Woodford.

Habitat

Habitat: Coastal vegetation and cleared land.
Altitude: 0–600 m **Annual rainfall:** above 1000 mm
Typical local abundance: Occasional–frequent.
Vegetation: Woodland, heath and disturbed sites.
Substrate: Sandy infertile soils (Parsons 1973), well-drained.
Exposure: Full sun.

Conservation

Conservation: Successfully competes with native vegetation for light (Parsons 1973).

Chrysocephalum apiculatum (Helichrysum apiculatum) ASTERACEAE

Common Everlasting, Yellow Buttons

Life history

Growth form: Herb to 60 cm high, usually with a woody base.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Bright yellow flowers, at any time of year but mainly spring; peak in October for CC and in April and November for CT.
Fruit/seed: Achene, upper half with bright yellow bristles, March (limited data).
Dispersal, establishment & growth: Optimal germination regime 20°/10°C, germination promoted by light, strong after ripening requirement (dormancy), dormancy broken by high temperature but not cold-stratification or gibberellic acid (Willis and Groves 1991).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread, but not on sandstone areas.
Select locations: Culoul Range, Pennant Hills, Rooty Hill, Rookwood, Badgerys Creek, Mt Annan, Appin, Moss Vale, Lithgow, Winburndale, Orange, Taralga.

Habitat

Habitat: Grassy patches in forests.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Woodland and open-forest, e.g. with *Eucalyptus tereticornis, E. deanei, E. mannifera, E. radiata.*
Substrate: Clay soils from shales, e.g. Wianamatta Group, fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: No shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Chrysocephalum semipapposum (Helichrysum semipapposum) ASTERACEAE

Clustered Everlasting, Yellow Buttons

Life history

Growth form: Aromatic herb to 60 cm high. Certain forms grade into *H. apiculatum.*
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Bright yellow, October–April, peak November.
Fruit/seed: Achene, with barbed bristles, mature March–April.

Dispersal, establishment & growth:
Fire response: Regrowth and suckers from rootstocks and lateral roots, no seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Western and southern Blue Mountains.
Select locations: Mt Kerry, Castle Hill, Hill End, Glanmire, Lithgow, Berrima, Abercrombie, Wombeyan Caves, Kangaroo Valley, Nowra.

Habitat

Habitat: Hills, mountains or isolated rocky rises.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt open-forest with herbaceous/grassy understorey. Ground stratum.
Substrate: Clay soils from basalt, shales etc, also limestone. Fertile soil. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Sheltered situations.

Conservation

Conservation: Rare, only 7/32 specimens collected since 1960, conservation status unknown.

Cichorium intybus * ASTERACEAE

Chicory

Life history

Growth form: Rosette herb with stems 30–120 cm high; well-developed tap-root (Lamp & Collet 1989).
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Blue, rarely white, November–April.
Fruit/seed: Achene 2–3 mm long, with minute pappus, mature May.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Has been used as a salad, condiment or vegetable.

Distribution

Status/origin: Naturalised exotic, native to Europe, N Africa, Asia. Cultivated for fodder and as a salad vegetable. Root roasted and ground, used to blend with coffee (Lamp & Collet 1989). Since ancient times, used as a medicine for eye ailments and for blood-purifying (Ciba-Geigy 1968–).
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Hornsby, Ermington, Parramatta, Richmond, Menangle (1894), Kiama, Bathurst.

Habitat

Habitat: Common roadside and wasteland weed.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Wasteland weeds.
Substrate: Clay soils.
Exposure: Full sun.

Conservation

Conservation: Weed of disturbed sites. Not invasive of bushland.

Cirsium vulgare * ASTERACEAE

Spear Thistle

Life history

Growth form: Biennial, erect herb to 1.5 m high with radical and cauline leaves; long, well developed taproot (Lamp & Collet 1989). Rosette leaves up to 35 cm long, older leaves deeply lobed and armed with spines, taproot branched, fleshy (Parsons & Cuthbertson 1992).

Vegetative spread: No.

Longevity: 2 years.

Primary juvenile period: 1–2 years in fertile soil, but in less fertile conditions may be several years (Klinkhamer & De Jong 1993).

Flowers: Pink–purple, October–January. Ample nectar production, honey is light, pale and candies hard; pollen supply useful because it occurs when other sources are deficient in Yellow Box areas (Lamp & Collet 1989).

Fruit/seed: Achene 3–6 mm long, with pappus of feather-like bristles 2–3 cm long, mature October–April. Up to 200 flower heads and 8000 seeds counted on individual plants (Parsons & Cuthbertson 1992).

Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Also animal and water-dispersed (Carr et al. 1992). Seeds germinate in autumn; most germinate rapidly with very little dormancy; seedling survival increased by rainfall but susceptible to flooding of root; rosettes withstand cold conditions but seedlings and young rosettes susceptible to drought (Klinkhamer & De Jong 1993). Extensive root system with fleshy storage develops in winter, rosette continues to grow in spring to 60 cm diam. (if rosettes die off in a dry summer, new rosette develops in autumn or winter), during spring of second year a flowering stem is produced from centre of rosette (Parsons 1973).

Fire response: Possibly resprouted after high-intensity fire (1/1994) at Lane Cove; flower buds within 26 weeks (P. Kubiak pers. comm.). Seedlings recorded less than 1 year after fire (Purdie 1977), probably result of post-fire dispersal into the area. Appears after disturbance, probably soil-stored seed (M. Clarke pers. comm.).

Interaction with other organisms: Seed eaten by Black Swan *Cygnus atratus*, Spotted Quail-thrush *Cinclosoma punctatum*, foodplant of Grey Teal *Anas gibberifrons* (Barker & Vestjens 1989,1990). Flowers and seed eaten by Sulphur-crested Cockatoo *Cacatua galerita* (Lepschi 1993). Spiny stems and leaves make it unpalatable to most stock (Klinkhamer & De Jong 1993), reducing the carrying capacity of paddocks; thick patches provide effective refuge for rabbits, fleshy root used to poison rabbits; spiny leaves and bracts transmit virus diseases between animals; biological control using gall fly is being investigated (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to N Africa, Europe and Asia. The subject of noxious weed legislation in the 1850s (Parsons & Cuthbertson 1992).

Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; LHI, Qld, Vic., Tas., S.A., W.A.

Distribution Sydney area: Widespread, western Sydney, upper Blue Mountains, Southern Highlands (P. Kodela pers. comm.).

Select locations: Wahroonga, Carlingford (M. Clarke pers. comm.), Mosman (1887), Oakville, Silverdale, Mt Annan, Lake Illawarra, Kangaroo Valley, Mt Wilson (1906), Mt Tomah, Capertee.

Habitat

Habitat: Wetland, river edges, wasteland. Abundant on roadsides, common weed of pastures (Lamp & Collet 1989). Disturbed edges (M. Clarke pers. comm.).

Altitude: 0–1000 m **Annual rainfall:** above 700 mm

Typical local abundance: Frequent.

Vegetation: Pastures, remnant native vegetation. Thistle communities, mainly with *Onopordum acanthium*, *Carduus nutans*, *C. tenuiflorus*, *C. pycnocephalus*, *Silybum marianum* (Doing et al. 1969).

Substrate: Clay soils from shales, basalt, fertile–very fertile; soil rich in nutrients (Ciba-Geigy 1968–). Watertable mostly low. Recorded on saline sites in western NSW (Semple 1993). Less common on sand and soils with humus content more than 30% and almost

absent from pure clay soil; wide range of pH, peaks on almost neutal soil, rare on soil less than 4.8–5.0 pH (Klinkhamer & De Jong 1993).
Exposure: 55% full daylight for highest rate of growth and seed production (Klinkhamer & De Jong 1993).

Conservation

Conservation: Common weed, plentiful throughout the State (Boorman 1921 Herbarium note). Declared noxious weed in some shires of NSW; recognised as weed in Victoria in 1856 (Parsons 1973).

Conyza albida * ASTERACEAE

Tall Fleabane

Life history

Growth form: Robust, erect herb to 2 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: At any time of year, peak April–June.
Fruit/seed: Achene, ovoid, with pappus of minutely barbed bristles, 3 mm long. Mature at any time of year, peak March–April.
Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed locally and widespread, readily colonising disturbed sites. Water and possibly animal-dispersed (Carr et al. 1992).
Fire response: Killed. Seedlings recorded less than 1 year after fire (Purdie 1977), probably recruiting from wind-blown seed.
Interaction with other organisms: Flowers eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to N America.
Botanical subregions: NC **CC** SC NT **CT** ST NWS CWS SWS SWP; LHI, Qld, Vic., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Dee Why, Manly, Ashfield (1916), Bondi, Ingleburn, Campbelltown, Windang, Katoomba, Coxs River, Robertson (P. Kodela pers. comm.), Barrengarry.

Habitat

Habitat: Weed of cultivation, pasture and wasteland.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: With other weedy species, or invading undisturbed areas in open sites in woodland.
Substrate: Very fertile–fertile soils on shale, sandstone and metamorphics. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: Light shade–no shade.

Conservation

Conservation: Weed of disturbed sites.

Conyza bilbaoana * ASTERACEAE

Canadian Fleabane

Life history

Growth form: Robust herb to 2 m high.
Vegetative spread: No.
Longevity: Up to 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, most of the year.
Fruit/seed: Achene with pappus of bristles 2–3 mm long, dispersed at maturity February–April.

Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC CT ST NWS SWS; Qld, Vic., S.A.
Distribution Sydney area: Mainly upper Blue Mountains and Bathurst area.
Select locations: Morisset (1899), Como (1899), Clarence, Jenolan Caves (1899), Wallerawang, Cudgegong, Yetholme, Hilltop.

Habitat

Habitat: Roadsides and disturbed land.
Altitude: 0–1100 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: With other wasteland weeds.
Substrate:
Exposure:

Conservation

Conservation: Weed of roadsides and disturbed land. Widespread by 1900.

Conyza bonariensis * ASTERACEAE

Flaxleaf Fleabane

Life history

Growth form: Robust, erect herb to 1 m high.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period: Less than 1 year.
Flowers: At any time.
Fruit/seed: Achene with pappus of white–pink capillary bristles 3 mm long, mature August–April.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed locally and probably long distance. Coloniser of disturbed sites.
Fire response: Probably killed, fruit within 15 weeks of high-intensity fire (1/1994) at Lane Cove; possibly resprouts after low intensity fire (P. Kubiak pers. comm.).
Interaction with other organisms: Seed eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; LHI, Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Coastal and western Sydney.
Select locations: Cheltenham, Manly, Como (1887), Little Bay, Cabarita, Windsor, Campbelltown, Albion Park, Bowral.

Habitat

Habitat: Roadsides, pastures and wasteland.
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: With roadside weeds.
Substrate: Sandy soils. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Weed of cultivation, pasture and wasteland. Not invasive of bushland.

Conyza canadensis var. *canadensis* * ASTERACEAE

Canadian Fleabane

Life history

Growth form: Robust, erect, herb to 1 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Throughout the year, flowers cream.
Fruit/seed: Achene with pappus of bristles 4 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Resprouts at ground level or below (Fox 1988).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to N America.
Botanical subregions: CC SC NT CT ST NWS SWS; LHI, Qld, Vic., Tas., S.A.
Distribution Sydney area: Widespread, but mainly western Blue Mountains.
Select locations: Clyde, Glen Davis, Coxs River (1909), Kowmung River.

Habitat

Habitat: Weed of cultivation, pasture and wasteland.
Altitude: 0–800 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Occasional.
Vegetation: Grassland, disturbed areas, river flats.
Substrate:
Exposure: Probably no shade.

Conservation

Conservation: Minor weed of disturbed sites.

Conyza parva * ASTERACEAE

Life history

Growth form: Erect herb, occasionally to 80 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White or tinged with mauve, summer–autumn.
Fruit/seed: Achene with pappus of barbed bristles 2–3 mm long, dispersed at maturity, February–May.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NT ST SWS; LHI , Qld, Vic., W.A.
Distribution Sydney area: Widespread, but mainly suburban area.
Select locations: Putty, Gosford, Hornsby, Wahroonga, Kurnell (1906), Cronulla, Ashfield, Menangle Park, Hayes Crossing.

Habitat

Habitat: Open sandy sites.
Altitude: 0–500 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Woodland, e.g. with *Angophora floribunda*, *Allocasuarina torulosa*.
Substrate: Sandy soil, red-brown loam, infertile. Watertable mostly low.
Exposure:

Conservation

Conservation: Minor weed.

Coreopsis lanceolata * ASTERACEAE

Coreopsis

Life history

Growth form: Herb, forming clumps, to 1 m high with radical and cauline leaves.
Vegetative spread: Spreads by stolons/rhizomes to form clumps.
Longevity: Indefinite.
Primary juvenile period:
Flowers: Yellow, summer.
Fruit/seed: Achene 2–3 mm long, with pappus of 2 awns.
Dispersal, establishment & growth: Diaspore: fruit, prolific seeder and germinator (anon 1991).
Fire response: Resprouted and germinated after high-intensity fire (1/1994) at Narrabeen, seedlings observed (P. Kubiak pers. comm.). Resprouts from short woody rhizome (R. Buchanan & M. Clarke pers. comm.).
Interaction with other organisms: Causes allergy in humans where density is high (Bass 1987).

Distribution

Status/origin: Naturalised exotic, native of N. America.
Botanical subregions: CC SC NT CT ST NWS SWP; Qld, Vic.
Distribution Sydney area: Sydney suburbs and Blue Mountains.
Select locations: Woy Woy, Northern Peninsula Beaches (M. Clarke pers. comm.), Terrey Hills, Belrose (P. Kodela pers. comm.), Cheltenham (1948), Northbridge, Middle Head, Camden, Linden, Wentworth Falls, Medlow Bath.

Habitat

Habitat: Roadsides, railway lines and in disturbed areas.
Altitude: 0–1000 mm **Annual rainfall:** above 700 mm, mainly above 1000 mm
Typical local abundance: Frequent.
Vegetation: With other roadside weeds, or degraded native vegetation, e.g. *Eucalyptus haemastoma* woodland.
Substrate: Sandy soils on sandstone, infertile, watertable permanently low, moisture supply intermittent, fresh.
Exposure: Light shade–no shade.

Conservation

Conservation: Vigorous weed capable of invading along tracks and stormwater drainage lines in bushland areas (R. Buchanan pers. comm.).

Cosmos bipinnatus * ASTERACEAE

Cosmos

Life history

Growth form: Erect herb 1 m high.
Vegetative spread: No.
Longevity: 6 months.
Primary juvenile period: 3 months.
Flowers: White, mauve, pink or red, disc yellow, mostly spring, November–May.
Fruit/seed: Achene with pappus of barbed awns.
Dispersal, establishment & growth: Diaspore: fruit, possibly wind-dispersed (Carr et al. 1992). Prolific seeder and germinator (Anon 1991).
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mexico, garden plant.
Botanical subregions: CC NT CT; Qld.
Distribution Sydney area: North from Sydney, sporadic.
Select locations: Erina, Richmond (1902), Royal Botanic Gardens (1902), Hornsby, Cheltenham, Glen Davis.

Habitat

Habitat: Wasteland.
Altitude: 0–300 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Wasteland weeds.
Substrate: Clay soils from shale, fertile.
Exposure: Full sun.

Conservation

Conservation: Garden plant, occurring occasionally near habitation, not invasive of bush.

Cotula alpina ASTERACEAE

Alpine Cotula

Life history

Growth form: Stoloniferous, herb.
Vegetative spread: Stoloniferous.
Longevity: Indefinite.
Primary juvenile period:
Flowers: Summer.
Fruit/seed: Achene 1.5–2 mm long with thick wing undifferentiated from body, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST; Vic Tas.
Distribution Sydney area: Lithgow.
Select locations: Littleton (near Lithgow) 1893, only record in area and northern limit. (Chiefly south from ACT.)

Habitat

Habitat: Wet sites.
Altitude: 900 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Sphagnum bogs.
Substrate: Poorly drained peaty soils.
Exposure:

Conservation

Conservation: Probably extinct in Sydney area, last collected in 1893.

Cotula australis ASTERACEAE

Common Cotula, Carrot Weed

Life history

Growth form: Herb usually less than 10 cm high, weakly rooting at nodes.
Vegetative spread: Possibly through rooting at nodes.
Longevity: Annual or short-lived perennial.
Primary juvenile period:
Flowers: August–March.
Fruit/seed: Achene, 1–1.5 mm long, with narrow wing.
Dispersal, establishment & growth: Diaspore: fruit, possibly wind or water-dispersed.
Fire response: Probably killed, fruiting within 15 weeks of high-intensity fire (1/1994) at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS NWP SWP; LHI, Qld, Vic., Tas., S.A., W.A., N.Z.

Distribution Sydney area: Sydney suburbs and western Blue Mountains.
Select locations: Pennant Hills, Elizabeth Bay (1888), Cooks River, La Perouse, Burwood, Jenolan Caves, Glen Davis.

Habitat

Habitat: Roadsides, and gardens in Sydney area, clifflines above creek at Glen Davis.
Altitude: 0–600 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–rare.
Vegetation: Open-forest, also roadsides, lawns, pastures, garden weed.
Substrate: Clay soils. Recorded on saline sites in western NSW (Semple 1993).
Exposure: ? full sun.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991).

Cotula coronopifolia *
ASTERACEAE

Water Buttons

Life history

Growth form: Herb to 20 cm high, erect to spreading, with weak succulent stems rooting from nodes and yellow flowers, plants luxuriant in water forming dense floating masses but diminutive forms on damp land.
Vegetative spread: Spreads over short distances by rooting at nodes.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, August–December.
Fruit/seed: Achene 1.5–2 mm long, winged, mature October–May .
Dispersal, establishment & growth: Diaspore: fruit, animal and water-dispersed (Carr et al. 1992). Growth rate quick. Coloniser of bare mud.
Fire response:
Interaction with other organisms: The crab *Halicarcinus lacustris* shows a distinct association with *C. coronopifolia* (Aston 1977).

Distribution

Status/origin: Native to S Africa (Harden 1992) long regarded also as native to Australia but now described as naturalised exotic (Harden 1992). Reported by Robert Brown to be introduced to Sydney by 1804 (Maiden 1909).
Botanical subregions: NC CC SC ST SWS SWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Coast, also Cumberland Plain but rare.
Select locations: Norah Head, Cheltenham, Dee Why, Centennial Park, Kogarah (1896), Homebush Bay, Lidcombe, Doonside, Campbelltown, Mt Kembla.

Habitat

Habitat: Wet mud along ephemeral creeks and saline flats.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Freshwater or brackish swamp, herbland and sedgeland, e.g. with *Triglochin procera* and saltmarsh, e.g. with *Sarcocornia quinqueflora, Samolus repens*.
Substrate: Saline and freshwater areas in still or slow-flowing waters to 45 cm deep and on surrounding dampland mud. Salinity range 0.2–60.0 ppt T.D.S. (Aston, 1977). Soil fertile. Watertable mostly high, moisture supply intermittent. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991). Status elsewhere unknown.

Craspedia canens ASTERACEAE

Life history

Growth form: Tufted herb 15–65 cm high, with 1–5 flowering scapes, fine white hairs covering the leaves, and thick, spreading roots. Plant in standing water 80 cm high (P. Kodela pers. comm.)
Vegetative spread: Erect herb to 50 cm high.
Longevity: Short-lived (1–3 years).
Primary juvenile period:
Flowers: Yellow, mainly September–December.
Fruit/seed: Achene 1.5–2 mm long with pappus of plumed bristles 4 mm long.
Dispersal, establishment & growth: Wind-dispersed short distances, possibly also water or stock-dispersed (J. Everett pers. comm.).
Fire response:
Interaction with other organisms: Palatable to cattle (J. Everett pers. comm.).

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST CWS SWS; Qld, Vic.
Distribution Sydney area: Thirlmere, Southern Highlands.
Select locations: Thirlmere, Wingecarribee Swamp.

Habitat

Habitat: Peatland.
Altitude: 0–700 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland, grassland and swamps, e.g. with *Carex*. Amongst sedges and along edges of drainage changes on swamp (P. Kodela pers. comm.).
Substrate: Sandy to peaty soils, dry–poorly-drained, fertile–infertile. Often where there is a high watertable, collection from shallow standing water (P. Kodela pers. comm.).
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Craspedia variabilis ASTERACEAE

Life history

Growth form: Erect herb to 50 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Early spring to early summer.
Fruit/seed: Achene 1.5–2.5 mm long with pappus of plumose bristles 3–6 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., S.A., W.A.
Distribution Sydney area: Western Sydney, southern Highlands.
Select locations: Agnes Banks, Long Swamp.

Habitat

Habitat: Eucalypt forest and near swamp margins (P. Kodela pers. comm.).
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt forest, woodland, e.g. with *Eucalyptus parramattensis* and grassland.
Substrate: Clay loams, alluvial or colluvial soils, infertile, watertable mostly high.
Exposure:

Conservation

Conservation: Widespread but probably rare. Conservation status unknown.

Crassocephalum crepidioides * ASTERACEAE

Thickhead

Life history

Growth form: Erect herb 50–100 cm high.
Vegetative spread: No.
Longevity: Less than 1 year.
Primary juvenile period: 4 months.
Flowers: Reddish, April–June.
Fruit/seed: Achene 2 mm long, with pappus of hairs 8–10 mm long, mature May–June.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Killed (M. Clarke pers. comm.). Seedling recruitment after high-intensity fire (1/1994) at Narrabeen, flowering within 4 months, seedlings observed (P. Kubiac pers. comm.).
Interaction with other organisms: Used medicinally in Fiji (Cambie & Ash 1994).

Distribution

Status/origin: Naturalised exotic, native to Africa and Madagascar.
Botanical subregions: NC CC NT; Qld.
Distribution Sydney area: Coast and coastal suburbs.
Select locations: Gordon & Warriewood (M. Clarke pers. comm.), Narrabeen (DHB), Clifton Gardens, Mosman (1966), Parsley Bay, Bellevue Hill, Otford.

Habitat

Habitat: Weed of disturbed sites.
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt woodland.
Substrate: Sandy soils, moderate nutrients.
Exposure: Full sun to medium shade.

Conservation

Conservation: Weed status unknown.

Crepis capillaris * ASTERACEAE

Smooth Hawksbeard

Life history

Growth form: Herb to 75 cm high, basal leaves usually a rosette.
Vegetative spread: No.
Longevity: 1–3 years.
Primary juvenile period:
Flowers: Yellow, November–April. Insect-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 2 mm long, with pappus of hairs 8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed (Carr et al. 1992), also dispersed by wind, water and people; moderate user or nitrogen and competitor for space (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC NT CT ST; Tas.
Distribution Sydney area: Coast but mainly Tablelands.
Select locations: Hurstville, Cambewarra, Nowra, Kurrajong Heights, Lithgow, Bathurst, Blayney (1899), Orange, Wombeyan Caves, Robertson.

Habitat

Habitat: Roadsides and disturbed areas.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional–frequent.
Vegetation: Grassy slopes and banks.
Substrate: Gravelly soils, from limestone, basalt, shale, fertile.
Exposure:

Conservation

Conservation: Weed status unknown.

Crepis foetida subsp. ***vulgare*** * ASTERACEAE

Stinking Hawksbeard

Life history

Growth form: Herb 10–50 cm high, basal leaves usually a rosette.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow, summer.
Fruit/seed: Achene 12–17 mm long, pappus of hairs 5–7 mm long, mature June.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC ST CWS SWS; Vic., Tas.
Distribution Sydney area: Penshurst.
Select locations: Penshurst (1906) only record.

Habitat

Habitat: Roadsides and disturbed areas.
Altitude: 200 m **Annual rainfall:** 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare, Sydney is northern limit.

Crepis setosa * ASTERACEAE

Life history

Growth form: Herb to 80 cm high, basal leaves usually a rosette.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, February.
Fruit/seed: Achene 3–5 mm long, with pappus of hairs 4–5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind and water-dispersed (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC; Vic., Tas.
Distribution Sydney area: Hornsby.
Select locations: Hornsby (1918) only record for NSW.

Habitat

Habitat: Recorded along laneway.
Altitude: 100 m **Annual rainfall:** 1200 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Soil rich in nutrients, moderately dry (Ciba-Geigy 1968–).
Exposure:

Conservation

Conservation: Probably now extinct.

Cymbonotus lawsonianus (Arctotis australiensis) ASTERACEAE

Bears-ear

Life history

Growth form: Stemless herb to 25 cm diameter.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, August–October, March–May.
Fruit/seed: Achene 2.5 mm long, no pappus, mature September–October.
Dispersal, establishment & growth:
Fire response:

Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Western Sydney, western Blue Mountains to Orange.
Select locations: Scheyville, St Marys, Narellan, Yerranderie, Hartley, Jenolan Caves, Winburndale, Orange, Abercrombie Caves, Moss Vale.

Habitat

Habitat: Short grassland.
Altitude: 0–1000 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt woodland with grassy ground cover, e.g. with *Eucalyptus moluccana, E. crebra, E. melliodora, E. macrorryncha*.
Substrate: Clay and sandy loams from shales, metamorphics, basalt, fertile, watertable permanently low.
Exposure: Probably full sun.

Conservation

Conservation: Presumed extinct in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Cymbonotus preissianus (Cymbonotus lawsonianus *misappl.*) ASTERACEAE

Life history

Growth form: Stemless herb to 25 cm diameter.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, August–March.
Fruit/seed: Achene 3–3.5 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST CWS SWS SWP; Vic., S.A., W.A.
Distribution Sydney area: Jenolan/Abercrombie, Orange.
Select locations: Oberon, Jenolan SF, Little River, Abercrombie Caves, Mt Werong, Mullion Range.

Habitat

Habitat: Grassy ground cover.
Altitude: above 800 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–rare.
Vegetation: Woodland or forest with grassy or open groundcover, e.g. with *Eucalyptus radiata, E. goniocalyx*.

Substrate: Basalt, granite, metamorphics, fertile soil, well-drained, recorded from scraped trail margin.
Exposure:

Conservation

Conservation: Conservation status unknown.

Cynara scolymus * ASTERACEAE

Globe Artichoke

Life history

Growth form: Herb to 2 m high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Purplish-blue, December.
Fruit/seed: Achene 6 mm long, with pappus of hairs 3–4 cm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms: Cultivated, young flower heads used as a vegetable.

Distribution

Status/origin: Naturalised exotic, native to Europe, introduced as vegetable plant.
Botanical subregions: CC CT CWS SWP; W.A.
Distribution Sydney area: Sporadic.
Select locations: Catherine Hill Bay (1921), Minto, Bathurst Cemetery.

Habitat

Habitat: Earthworks, disturbed sites.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Naturalised sporadically, not invasive.

Delairea odorata * (Senecio mikanioides) ASTERACEAE

Cape Ivy

Life history

Growth form: Climbing or scrambling plant with stems many metres long.
Vegetative spread: Stoloniferous.
Longevity: Perennial.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, May–August. Probably bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 2 mm long, with pappus 5 mm long, not persistent, mature July, August. Potential seed set/plant 20 000–40 000 (Lawrence (1985).
Dispersal, establishment & growth: Diaspore: stem fragments, dispersed by gravity or water (Anon 1991). Effectiveness of seed dispersal not known.
Fire response: Usually fails to burn (R. Buchanan pers. comm.). Probably killed by high-intensity fire (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa, introduced as garden plant.
Botanical subregions: NC CC SC CT; Vic., Tas., S.A.
Distribution Sydney area: Mainly coastal.
Select locations: Hornsby, Narrabeen, Middle Harbour Creek (L.McD.), Woolloomooloo (1902), Stanwell Park, Shellharbour 1906, Albion Park, Minnamurra, Liverpool, Douglas Park, Kangaloon.

Habitat

Habitat: Weed in moist gullies, roadsides, riverbanks.
Altitude: 0–700 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Climbs on small trees or over shrubs forming dense ground cover. Moist eucalypt forest, e.g. with *Eucalyptus saligna*, *Syncarpia glomulifera*.
Substrate: Soils from shale, alluvium, and possibly basalt, medium to high nutrient. Requires moisture (M. Clarke pers. comm.).
Exposure: Sheltered, shady site.

Conservation

Conservation: Reported as major weed, carpeting the ground and covering shrubs on Gooseberry Island (Lake Illawarra) in 1891, first reported there in 1857 — recommended control was to use goats (note with Herbarium specimen). Now a widespread and significant bushland weed, though not frequent, e.g. restricted by limited distribution of moist eucalypt forest (R. Buchanan pers. comm.).

Dimorphotheca pluvialis * ASTERACEAE

Cape Marigold

Life history

Growth form: Herb to 20 cm high.
Vegetative spread:
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow and purplish, August–November.
Fruit/seed: Achene 6–8 mm long, with broad wing, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to South Africa, introduced as ornamental.
Botanical subregions: CC NWS; S.A.
Distribution Sydney area: Coastal headlands in Sydney suburbs.
Select locations: Bangally Head, Sth Bungan Head, Bronte/Tamarama Headland (1976).

Habitat

Habitat: Coastal headlands.
Altitude: 0–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassy shrubland with *Gazania*, *Westringia*, *Chrysanthemoides*.
Substrate: Sandstone cliffs, probably with clay soil influence.
Exposure:

Conservation

Conservation: Locally naturalised from nearby gardens.

Dittrichia graveolens * ASTERACEAE

Stinkwort

Life history

Growth form: Erect, densely-branched herb with characteristic conical shape, 30–60 cm high; stem with glandular hairs that exude sticky, strong-scented oil.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, March–April.
Fruit/seed: Achene 2 mm long, pubescent, with pappus of bristles, mature April–June.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, reported growing to 1.2 m high after heavy rains at Ingleburn.

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean region including N Africa.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Wahroonga, Duck River (1909), Cabramatta, Five Islands, Nowra, Clarence (1900), Kowmung River, Hilltop, Carcoar.

Habitat

Habitat: Roadsides, old quarries, saltmarsh.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Weedy, disturbed sites.
Substrate: Stony river flats, clay soils, recorded in saltmarsh indicating possible salt tolerance. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Weed status unknown.

Echinops sphaerocephalus * ASTERACEAE

Globe Thistle

Life history

Growth form: Erect herb 0.5–2 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White or greyish, summer–autumn.
Fruit/seed: Achene, with partially fused pappus, surrounded by bristles.
Dispersal, establishment & growth: Diaspore: fruit. Possibly animal-dispersed, e.g. sheep, in wool.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia.
Botanical subregions: CT CWS.
Distribution Sydney area: Gulgong–Orange.
Select locations: Gulgong (1976), Orange (1976).

Habitat

Habitat: Disturbed sites.
Altitude: 800 m **Annual rainfall:** 1000 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Basalt, fertile soil.
Exposure:

Conservation

Conservation: Recently reported exotic species, status unknown.

Eclipta platyglossa ASTERACEAE

Twin-heads

Life history

Growth form: Usually prostrate herb to 25 cm high, rooting at the nodes.
Vegetative spread: Limited, rooting from nodes.
Longevity: 2 years.
Primary juvenile period:
Flowers: Yellow, January–April.

Fruit/seed: Achene, c. 3 mm long, pappus minute. Mature January–April.
Dispersal, establishment & growth: Diaspore: fruit, probably water-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT NWS CWS SWS NWP SWP SFWP; all mainland States.
Distribution Sydney area: Coastal and western Sydney.
Select locations: Narrabeen, Manly, Royal NP, Richmond, Doonside, Casula.

Habitat

Habitat: Swamps, creeklines.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Swamp woodland,, e.g. with *Eucalyptus amplifolia, Casuarina glauca, Melaleuca styphelioides*.
Substrate: Floodplain alluvium, fertile. Watertable mostly high.
Exposure: Light shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), rare elsewhere.

Enydra fluctuans ASTERACEAE

Life history

Growth form: Herb with soft, creeping stems and opposite leaves.
Vegetative spread: Stem-creeping, rooting from nodes.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellowish, spring–summer.
Fruit/seed: Achene, no pappus.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Coast, Sydney Harbour to Port Hacking
Select locations: Kurnell, Port Hacking.

Habitat

Habitat: Swamps.
Altitude: 0–10 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation: Swamps
Substrate:
Exposure:

Conservation

Conservation: Port Hacking is the southern limit. Rare, status unknown.

Epaltes australis (Sphaeromorpha australis) ASTERACEAE

Spreading Nut-heads

Life history

Growth form: Herb 3–25 cm high.
Vegetative spread:
Longevity: Probably short-lived.
Primary juvenile period:

Flowers: Yellowish, September–April.
Fruit/seed: Achene 1–1.5 mm long, with membranous pappus, mature September–April.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT NWP SWP NFWP SFWP; all mainland States.
Distribution Sydney area: Coast and western Sydney.
Select locations: Roseville, Manly, Revesby, Fairfield, Richmond, St Marys, Warrimoo, Appin, Wattamolla, Albion Park.

Habitat

Habitat: Margins of swampy areas.
Altitude: 0–300 mm **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Swamp vegetation.
Substrate: Sandy to clay soils, watertable periodically high, sometimes brackish.
Exposure: Full sun to light shade.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), but status elsewhere unknown.

Erechtites valerianifolia * ASTERACEAE

Brazilian Fireweed

Life history

Growth form: Erect herb 1–1.5 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–mauve, June–November.
Fruit/seed: Achene 2.5–3.5 mm long, with pappus of numerous hairs.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Probably killed, one plant flowering and fruiting withing 30 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Coastal, mainly Gosford–Wyong.
Select locations: Dora Creek, Avoca, Peats Ridge, Woy Woy (1929), Red Cedar Flat (Royal NP 1984).

Habitat

Habitat: Weed of fertile soils.
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate: Fertile soils.
Exposure:

Conservation

Conservation: Mainly confined north of Gosford but recent collection (1984) from Royal NP suggests species is spreading. Common name suggests potential to spread after fire.

Erigeron karvinskianus * ASTERACEAE

Bony-tip Fleabane

Life history

Growth form: Sprawling herb 20–30 cm high.
Vegetative spread: From prostrate stems (R. Buchanan pers. comm.).
Longevity: Indefinite.
Primary juvenile period:
Flowers: Pale purple turning white then pink. Flowers at any time of year (R. Buchanan pes. comm.).
Fruit/seed: Achene, flattened, 1 mm long with pappus of fine whitish hairs 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, water-dispersed (M. Clarke pers. comm.).
Fire response: Resprouted and flowered within 11 weeks, releasing seeds within 26 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.). Resprouts after low-moderate intensity fires, germinates after any fire (R. Buchanan pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to America. Introduced as garden ornamental occasionally escaping from gardens and rockeries (Harden 1992).
Botanical subregions: NC CC CT NWS; Vic., S.A., W.A.
Distribution Sydney area: Widespread but near habitation.
Select locations: Avoca, Cheltenham, Lindfield (1960), Pymble, Foxground (1944), Leura, Katoomba, Blackheath.

Habitat

Habitat: Watercourses, stormwater drains, slopes, path edges.
Altitude: 0–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Moist eucalypt forest, disturbed watercourses.
Substrate: Sandy soils, fertile–infertile. Damp sandstone rocks, garden rock walls, stormwater outlets (R. Buchanan & M. Clarke pers. comm.).
Exposure: Mid shade–full sun (R. Buchanan pers. comm.).

Conservation

Conservation: Potential to invade bush along disturbed creeks, e.g. Katoomba area.

Euchiton gymnocephalus (Gnaphalium gymnocephalum) ASTERACEAE

Creeping Cudweed

Life history

Growth form: Herb 10–35 cm high.
Vegetative spread: Spreads by stolons.
Longevity: Perennial.
Primary juvenile period:
Flowers: October–April.
Fruit/seed: Achene 0.7 mm long with pappus of non-persistent bristles 3 mm long, mature December–April.
Dispersal, establishment & growth: Diaspore: fruit. Coloniser.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS CWS SWS; Vic., Tas., W.A.
Distribution Sydney area: Widespread.
Select locations: Culoul Range, Ourimbah, Bayview, Wahroonga, Royal NP, Dapto, Razorback, Jenolan Caves, Mullion Range.

Habitat

Habitat: Eucalypt open-forest.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional

Vegetation: Eucalypt open-forest, e.g. *Eucalyptus deanei, E. dives, E. eugenioides*, occasionally in dry rainforest margins.
Substrate: Sandy to clay loam from shale, granite, metasediments, infertile–fertile.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Euchiton involucratus (Gnaphalium involucratum) ASTERACEAE

Star Cudweed

Life history

Growth form: Woolly, stoloniferous herb 12–50 cm high.
Vegetative spread: Spreads by stolons.
Longevity: Annual or biennial (Purdie 1977).
Primary juvenile period: 1–2 years.
Flowers: At any time of year.
Fruit/seed: Achene 0.6 mm long, mature December–February.
Dispersal, establishment & growth: Diaspore: fruit. Coloniser.
Fire response: Seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS CWS SWS; Qld, Vic., Tas., S.A.
Distribution Sydney area: Coast and montane areas.
Select locations: Martinsville, Carlingford, Beecroft, Bundeena, Orange, Wingecarribee Swamp.

Habitat

Habitat: Creeks, roadsides, pasture, swamps.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Moist woodland, sedgeland, grassland, alluvial or peaty soils, fertile–infertile, watertable mostly high.
Substrate: Alluvial or fibrous peaty soils, fertile–infertile. Watertable mostly high.
Exposure:

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Euryops chrysanthemoides * (Gamolepis chrysanthemoides) ASTERACEAE

Life history

Growth form: Shrub 0.5–1.5 m high.
Vegetative spread:
Longevity: Indefinite.
Primary juvenile period:
Flowers: Yellow, June.
Fruit/seed: Achene 0.5 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa.
Botanical subregions: CC.
Distribution Sydney area: Northbridge to Wollongong (Harden 1992).
Select locations: (no specimens)

Habitat

Habitat: Weed of roadsides.
Altitude: 0–200 mm **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation: Roadside weeds.
Substrate:
Exposure:

Conservation

Conservation: Weed status unknown.

Facelis retusa * ASTERACEAE

Life history

Growth form: Herb, 5–30 cm high, with decumbent stems.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White, purple-tipped, October–January.
Fruit/seed: Achene 1–1.5 mm long, with pappus of numerous papillary hairs.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC CWS.
Distribution Sydney area: Suburban area and Albion Park.
Select locations: Cheltenham, Northbridge, Wentworthville, Leumeah, Albion Park (1948).

Habitat

Habitat: Weed near habitation: gardens, paths, paddocks.
Altitude: 0–100 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Wasteland weeds.
Substrate: Sandy, well-drained soils, fertile.
Exposure:

Conservation

Conservation: Garden weed, probably not invasive of bushland, though probably actively spreading.

Galinsoga parviflora * ASTERACEAE

Potato Weed

Life history

Growth form: Herb 10–60 cm high, with opposite leaves.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Flowers 4–6 weeks after germination (Ciba-Geigy 1968–), fruiting within 15 weeks (P. Kubiak pers. comm.).
Flowers: White, disc yellow, February–August. Self-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 2 mm long, with pappus of short bristles. Fruits ripen on pulled out plants (Ciba-Geigy 1968–).
Dispersal, establishment & growth: Diaspore: fruit. Dispersed by wind, water, animals and people; germinates in light; vigorous user of nitrogen and competitor for space; sensitive to frost; 2–3 generations per year in favourable conditions (Ciba-Geigy 1968–).
Fire response: Killed (M. Clarke pers. comm.). Flowered within 12 weeks, and fruiting within 15 weeks of high-intensity fire (1/1994) at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms: Cattle and sheep especially like this herb (Ciba-Geigy 1968–).

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NT CT NWS; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Waitara, Dural, Lane Cove, Pennant Hills (M. Clarke pers. comm.). Port Jackson (1850), Como (1887), Richmond, Heathcote, Wollongong, Albion Park, Mt Irvine, Mt Wilson.

Habitat

Habitat: Disturbed habitats and agricultural areas.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Moist eucalypt forests, mangrove edges, disturbed watercourses (M. Clarke pers. comm.).
Substrate: Fertile soil on sandstone, shale. Nitrogenous soil (Ciba-Geigy 1968–).
Exposure: Full sun–semi-shade (M. Clarke pers. comm.).

Conservation

Conservation: Weed of disturbed sites, minor invader of bush. Often confused with *Bidens pilosa* or *Sigesbeckia orientalis* (M. Clarke pers. comm.).

Gazania rigens * ASTERACEAE

Life history

Growth form: Herb with decumbent stems forming mats.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Bright orange–deep yellow, most of the year.
Fruit/seed: Achene 4 mm long, covered by hairs.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, probably also water-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa. Introduced as garden ornamental, occasionally escaping.
Botanical subregions: CC; S.A.
Distribution Sydney area: Coastal headlands and beaches.
Select locations: Pearl Beach (1973), Palm Beach (1972), Bangally Head, Bronte/Tamarama Headland.

Habitat

Habitat: Coastal sand dunes and roadsides.
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Coastal herbland, e.g. with *Carpobrotus, Lampranthus, Westringia.*
Substrate: Beach sand and sandstone cliffs.
Exposure: Full sun.

Conservation

Conservation: Localised garden escape though relatively recent collections (since 1972) possibly indicate increasing spread.

Glossogyne tannensis (Glossogyne tenuifolia) ASTERACEAE

Cobbler's Tack

Life history

Growth form: Herb with erect stems to 60 cm.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:

Flowers: Yellow, December–April.
Fruit/seed: Achene 7–8 mm long, pappus with barbed awns 1–2 mm long, mature December–April.
Dispersal, establishment & growth: Diaspore: fruit, probably animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT NWS CWS NWP NFWP; all mainland States, Pac., Asia, India.
Distribution Sydney area: Western Sydney, Capertee and Shoalhaven Valleys.
Select locations: Ryde, Glenfield, Ingleburn, Doonside, Capertee Valley, Shoalhaven Gorge.

Habitat

Habitat: Drier grasslands and woodlands.
Altitude: 0–600 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassland and woodland, e.g. with *Eucalyptus moluccana* and *E. fibrosa*.
Substrate: Clay soils of moderate fertility, from shales, quartzite, slates.
Exposure: Probably full sun.

Conservation

Conservation: Rare and vulnerable in Western Sydney (Benson & McDougall 1991), though elsewhere in NSW reported to be 'common and abundant in large areas if there has been a high summer rainfall' (Harden 1992).

Gnaphalium americanum * ASTERACEAE

Life history

Growth form: Slender herb 10–35 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Cream–white, mainly October–January.
Fruit/seed: Achene 0.5 mm high, with pappus of bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, possibly animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic of relatively recent origin, native to Central and S America.
Botanical subregions: NC CC SC CT ST; LHI.
Distribution Sydney area: Mainly coastal.
Select locations: Royal Botanic Gardens, Silverwater (1964), Leuhmeah (1964), Werong Beach, Hartley, Burrawang.

Habitat

Habitat: Disturbed areas, tracks, vacant land.
Altitude: 0–700 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: With grasses and herbs.
Substrate: Sandy to stony clay soils.
Exposure: Probably full sun.

Conservation

Conservation: Weed of disturbed sites, probably still expanding range.

Gnaphalium calviceps * ASTERACEAE

Life history

Growth form: Herb 10–20 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Brown, mainly October–December.
Fruit/seed: Achene 0.4–0.6 mm long, with a pappus of bristles 2 mm long, mature October–February.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NT ST NWS; Vic., Tas., S.A.
Distribution Sydney area: Sydney, Cumberland Plain and Bathurst.
Select locations: Royal Botanic Gardens (1902), Little Bay, Cabarita, Castle Hill, Glenfield, Norton's Basin, Mt Annan, Thirlmere, Bathurst.

Habitat

Habitat: Disturbed sites including sheep pens.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Grassland or open woodland, e.g. with *Eucalyptus blakelyi*.
Substrate: Clay soils, fertile.
Exposure:

Conservation

Conservation: Weed of disturbed sites, not invasive of bushland.

Gnaphalium coarctatum ASTERACEAE

Purplish Cudweed

Life history

Growth form: Herb 7–40 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: October–April.
Fruit/seed: Achene, 0.7 mm long, mature November–December.
Dispersal, establishment & growth: Diaspore: fruit, wind- and possibly animal-dispersed (Carr et al. 1992).
Fire response: Probably killed; fruiting within 25 weeks, seeds shed within 27 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms: Leaves, seed, and stems eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to America.
Botanical subregions: NC CC SC NT NWS CWS SWS; LHI, Qld, Vic.
Distribution Sydney area: Mainly coast.
Select locations: Narara, Point Claire (1931), Pennant Hills, Narrabeen, Manly, Granville, Lower Portland, Castle Hill.

Habitat

Habitat: Disturbed ground, footpaths, parks, cleared areas.
Altitude: 0–100 m **Annual rainfall:** above 750 mm
Typical local abundance: Occasional–frequent.
Vegetation: Lawns, grassland and with weeds of disturbed sites, e.g. *Bidens pilosa, Plantago lanceolata*.
Substrate: Mainly clay soils, fertile, cracks in pavements.
Exposure: Full sun.

Conservation

Conservation: Weed of disturbed sites, not likely to be invasive of bushland.

Gnaphalium pensylvanicum * ASTERACEAE

Life history

Growth form: Erect to procumbent woolly herb 20–50 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, September–October.
Fruit/seed: Achene 0.5 mm long, with pappus of non-persistent bristles 2 mm long, mature July–December.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response: Probably killed; flowering and fruiting within 15 weeks of high-intensity fire at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to America and introduced by 1805.
Botanical subregions: NC CC SC; LHI, Qld.
Distribution Sydney area: Sydney suburbs.
Select locations: Ettalong, Harbord, Carlingford, Lane Cove, Port Jackson (1805), Centennial Park, Sans Souci, Ingleburn, Castle Hill, Richmond.

Habitat

Habitat: Disturbed sites, garden and lawn weed, along tracks.
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Weeds of disturbed sites.
Substrate: Sandy soil, infertile.
Exposure: Full sun.

Conservation

Conservation: Long established weed of disturbed sites, unlikely to invade bushland.

Gnaphalium polycaulon ASTERACEAE

Life history

Growth form: Erect to ascending herb to 15 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: July–December.
Fruit/seed: Achene 0.5 mm long, with pappus of barbed bristles 2 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably animal-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT NWP SWP; Qld, Vic., W.A.
Distribution Sydney area: Newnes Plateau.
Select locations: Newnes Glowworm tunnel (only record for area).

Habitat

Habitat: Along road verge though reported along watercourses further west.
Altitude: 1000 m **Annual rainfall:** 1200 mm
Typical local abundance: Occasional.
Vegetation: Heath–scrub.
Substrate: Sandy podsolic soil on sandstone.
Exposure:

Conservation

Conservation: Mainly a western species, Newnes is eastern limit. Conservation status unknown.

Gnaphalium sphaericum ASTERACEAE

Life history

Growth form: Erect herb 5–50 cm high, rarely biennial.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: Less than 1 year.
Flowers: At any time of year.
Fruit/seed: Achene 0.7 mm long with pappus of non-persistent bristles 2 mm long, matures at any time of year.
Dispersal, establishment & growth: Diaspore: fruit. Coloniser.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Culoul range, Windsor, Castle Hill, Wahroonga, Minto, Bulli Pass, Albion Park, Berry, Mt Bindo, Boyd Plateau.

Habitat

Habitat: Disturbed sites, roadsides, bare ground, ridge-top, slopes, creek bank.
Altitude: 0–1100 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional–common.
Vegetation: Eucalypt woodland and grassland, e.g. with *Eucalyptus deanei, E. tereticornis, E. fibrosa, E. pauciflora, E. dalrympleana, E. dives.*
Substrate: Various soils from shale, volcanics, slate, metasediment, rare on sandstone.
Exposure: Mid shade–full sun.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Grindelia camporum var. *australis* * ASTERACEAE

Life history

Growth form: Herb with woody crown growing 0.5–1.2 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow, summer–autumn. January–May.
Fruit/seed: Achene 2–3.5 mm long, with pappus of several smooth awns.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to N America. Occasionally naturalised.
Botanical subregions: CT.
Distribution Sydney area: Bathurst–Orange.
Select locations: Bathurst–Orange (1932), Bathurst (1944).

Habitat

Habitat: Pasture and stream banks.
Altitude: 700–1000 m **Annual rainfall:** 600–900 mm
Typical local abundance:
Vegetation: Ground stratum, pasture and stream banks.
Substrate:
Exposure:

Conservation

Conservation: Occasionally naturalised.

Guizotia abyssinica * ASTERACEAE

Rantil, Niger Seed

Life history

Growth form: Herb to 2 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, April–June.
Fruit/seed: Achene 4 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Ethiopia. Cultivated in Africa and India for oil. The few collections have resulted from imported bird seed (Harden 1992).
Botanical subregions: NC CC; Qld.
Distribution Sydney area: Sydney suburbs.
Select locations: Eastwood, Earlwood, Kellyville (1974).

Habitat

Habitat: Gardens.
Altitude: 0–100 m **Annual rainfall:** above 1000 mm.
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Uncommon weed.

Gymnocoronis spilanthoides * ASTERACEAE

Temple Plant, Senegal Tea

Life history

Growth form: Rhizomatous herb 1–2.5 m high; stems ribbed, hollow and cane-like.
Vegetative spread: Spreading by rhizome.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, February.
Fruit/seed: Achene 0.5 mm long, no pappus.
Dispersal, establishment & growth: Diaspore: fruit, also regrows from stem nodes. Re-grew from plants raked from dam and sprayed with herbicide (Herbarium note 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC.
Distribution Sydney area: Sydney, Illawarra.
Select locations: Duck River (Auburn) (1991), Dapto (1985), Fairy Meadow (1985).

Habitat

Habitat: Riverbanks and in still to slow-flowing waters in dams, drains and creeks.
Altitude: 0–100 m **Annual rainfall:** above 1000 mm
Typical local abundance: Dominant–frequent.
Vegetation: Wetland.
Substrate: Riverbank alluvium. Soil fertile. Watertable permanently high, moisture supply continuous, fresh; grows from bank into water 1 m deep (Herbarium note 1985).
Exposure: No shade.

Conservation

Conservation: A declared noxious weed in NSW. Probably spreading.

Hedypnois rhagadioloides subsp. *cretica* * ASTERACEAE

Cretan Weed

Life history

Growth form: Annual 3–50 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, August–November.
Fruit/seed: Achene 5–7 mm long, with pappus 3–6 mm long, barbed.
Dispersal, establishment & growth: Diaspore: fruit, possibly animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean region.
Botanical subregions: CC NT NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Western Sydney.
Select locations: Hornsby, Homebush (1909), Flemington Saleyards, Bringelly, Menangle, Camden, Albion Park.

Habitat

Habitat: Weed of pastures and disturbed sites.
Altitude: 0–200 m **Annual rainfall:** 700–1200 mm
Typical local abundance: Rare.
Vegetation: Grassland.
Substrate: Clay soil from shale, fertile. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Minor weed of pastures, not invasive of bushland.

Helianthus annuus * ASTERACEAE

Common Sunflower

Life history

Growth form: Herb with taproot, 1–2 m high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: 3 months.
Flowers: Bright yellow, throughout the year.
Fruit/seed: Achene, 5–10 mm long, no pappus.
Dispersal, establishment & growth: Diaspore: fruit, dispersed by humans.
Fire response: Flowering within 12–13 weeks of high-intensity fire 1/1994 at Lane Cove and Narrabeen, possibly growing from seed introduced to feed wildlife (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to N America. Widely cultivated for the oil extracted from the seeds, and sometimes grown as an ornamental. Cultivated forms have larger heads than naturalised plants.
Botanical subregions: NC CC ST NWS CWS NWP SWP NFWP SFWP; all mainland States.
Distribution Sydney area: Narellan.
Select locations: Narellan Rubbish tip (1968) only record.

Habitat

Habitat: Roadsides and disturbed sites.
Altitude: 0–300 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure: Full sun.

Conservation

Conservation: Probably established from split grain and unlikely to persist. Unlikely to be naturalised in Sydney area.

Helianthus tuberosus * ASTERACEAE

Jerusalem Artichoke

Life history

Growth form: Erect herb with short rhizomes and tubers, 1.5–3 m high.
Vegetative spread: Tubers.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, summer.
Fruit/seed: Achene, 4–6 mm long, with pappus of scales.
Dispersal, establishment & growth: Diaspore: fruit, tubers, dispersed by humans.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native of North and S America. Frequently cultivated for its edible tubers. Rare garden escape probably as a result of dumping tubers.
Botanical subregions: CC CWS SWP; W.A.
Distribution Sydney area: Sydney suburbs.
Select locations: Northbridge (1965), Campbelltown (1971.

Habitat

Habitat: Roadsides and in wasteland near habitation (Harden 1992).
Altitude: 0–300 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation:
Substrate: Clay soil.
Exposure:

Conservation

Conservation: Minor weed, rare in Sydney area.

Helichrysum adenophorum var. *waddelliae* ASTERACEAE

Life history

Growth form: Herb 20–50 cm high, grows in clumps.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–pink, September–March.
Fruit/seed: Achene with pappus of barbed bristles, mature April.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, possibly colonising disturbed soil.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC CT ST; Vic , S.A.
Distribution Sydney area: Newnes, Putty area, Paddys River.
Select locations: Howes Valley, Putty, Clarence, Lithgow, Paddys River.

Habitat

Habitat: Hillsides, ridgetops.
Altitude: 0–1100 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt forest.
Substrate: Sand and sandy soil on sandstone, infertile, well-drained.
Exposure:

Conservation

Conservation: Conservation status unknown.

Helichrysum calvertianum ASTERACEAE

Life history

Growth form: Twiggy subshrub to 30 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, often tinged pink, January–July.
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT.
Distribution Sydney area: Restricted to Fitzroy Falls, Berrima and Mittagong.
Select locations: Mittagong, Berrima, Joadja, Fitzroy Falls, Barbers Creek.

Habitat

Habitat: Eucalypt woodland.
Altitude: 800–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Dry eucalypt woodland.
Substrate: Sandy soil.
Exposure:

Conservation

Conservation: Local endemic species, uncommon, conservation status unknown.

Helichrysum collinum ASTERACEAE

Life history

Growth form: Robust, woody herb to 1 m high, grey–white woolly.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, September–March, peak November.
Fruit/seed: Achene with pappus of bristles, mature October–December.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response: Regrowth only from surviving rootstocks, seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT **CT** ST NWS CWS NWP; Qld.
Distribution Sydney area: Widespread.
Select locations: Wollombi, Como, Macquarie Fields, Glenbrook, Yanderra, Yerranderie, Bomaderry, Kanangra, Hill Top, Mittagong, Wingello.

Habitat

Habitat: Ridges.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt woodland, e.g. with *Angophora bakeri, Eucalyptus sieberi, E. punctata* with shrubby understorey.
Substrate: Sandy loam from sandstone, also shale, deep, well-drained.
Exposure:

Conservation

Conservation: Not common, conservation status unknown.

Helichrysum elatum ASTERACEAE

White Paper Daisy

Life history

Growth form: Woody shrub or subshrub 60–200 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, June–November, peak September.
Fruit/seed: Achene with pappus of bristles 7 mm long, mature June–January, peak October.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed (Westoby et al. 1990), possible coloniser of disturbed soil.
Fire response: Possibly killed by high-intensity fire at Narrabeen (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Qld, Vic
Distribution Sydney area: Widespread, localised.
Select locations: Mt Kindarun, Tuggerah, Gosford, Hornsby, Mt Keira, Thirlmere, Berry, Kangaroo Valley, Mt Wilson, Katoomba, Hill Top, Kangaloon (P. Kodela pers. comm.).

Habitat

Habitat: Hillsides, valleys.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: In open to tall open eucalypt forest, e.g. *Eucalyptus fastigata, E. cypellocarpa, E. obliqua, E. globoidea* (P. Kodela pers. comm.), also edge of rainforest.
Substrate: High nutrient soils, disturbed sites, mostly on basalt, shale or on sandy soil from sandstone, conglomerate. On shale, sometimes sandstone, in Kangaloon area (P. Kodela pers. comm.).
Exposure: Sheltered.

Conservation

Conservation: Conservation status unknown.

Helichrysum leucopsideum ASTERACEAE

Satin Everlasting

Life history

Growth form: Herb 15–20 cm high, with woody rootstock.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White, sometimes tinged pink in bud, November–May.
Fruit/seed: Achene with pappus of barbed bristles, January–April.
Dispersal, establishment & growth: Diaspore: fruit. Possible coloniser of disturbed ground.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC CT ST NWP SWP SFWP; Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread, but mainly upper Blue Mountains, localised.
Select locations: Kogarah, Cambewarra, Newnes Plateau, Bell, Hassans Walls, Hilltop, Kangaloon, Wingello.

Habitat

Habitat: Slopes and ridges.
Altitude: 0–1100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt forest, e.g. with *Pteridium esculentum, Lomandra longifolia, Eucalyptus rossii.*
Substrate: Sandy loam.

Exposure: Open areas.

Conservation

Conservation: Conservation status unknown.

Helichrysum rutidolepis ASTERACEAE

Pale Everlasting

Life history

Growth form: Decumbent, woolly herb 15–40 cm high.
Vegetative spread: Creeping rhizome.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, December–June, peak March–April.
Fruit/seed: Achene with pappus of bristles, mature March–April.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Resprouted, a few plants flowering and fruiting within 18 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT **CT** ST SWS SWP; Vic., S.A.
Distribution Sydney area: Coast and mountains.
Select locations: Eastwood, Lane Cove River, Douglas Park, Euroka, Austinmer, Mt Gibraltar, Kangaroo Valley, Mt Hay, Jenolan Caves, Kanangra.

Habitat

Habitat: Hillsides, rocky gorges.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Wet eucalypt forest and rainforest fringes, e.g. with *Eucalyptus fastigata, E. radiata, E. stellulata, E. punctata*, or grasslands, e.g. with *Stellaria pungens*.
Substrate: Basalt soils, less commonly sandy loam from sandstone, fertile soil.
Exposure:

Conservation

Conservation: Not known.

Helichrysum scorpioides ASTERACEAE

Button Everlasting

Life history

Growth form: Herb to 30 cm high. An undescribed taxon close to *H. scorpioides* occurs in the Robertson–Mittagong area (P. Kodela pers. comm.)
Vegetative spread: New growth from rhizomes up to 30 cm from old stem, probably with subsequent separation to form new plants. [Can be propagated by severing sucker shoots (Langkamp 1987).]
Longevity: Perennial. Individual plants probably relatively short-lived.
Primary juvenile period:
Flowers: Yellowish, December–June.
Fruit/seed: Achene with barbed hairs. Mature February–June.
Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed.
Fire response: Resprouted, some plants flowering within 16 weeks and fruiting within 23 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT **CT** ST NWS CWS; Vic., Tas., S.A.
Distribution Sydney area: Widespread.
Select locations: Lane Cove River, Otford, Berry, Kangaroo Valley, Castlereagh, Glenbrook, Mt Wilson, Kanangra Deep, Jenolan Caves, Hilltop, Mt Gibraltar.

Habitat

Habitat: Disturbed sites, edges of wooded roadsides.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Open-forest, e.g. with *Eucalyptus radiata, E. punctata, E. piperita, E. fastigata, E. viminalis, E. blaxlandii*. Woodland, e.g. *Eucalyptus sclerophylla–Angophora bakeri*.
Substrate: Variable brown clay from basalt, sandy loam from sandstone, shale–sandstone transition. Soil very fertile–fertile. Watertable mostly low, moisture supply intermittent, fresh, sometimes moist sites, e.g. swamp edge.
Exposure: Sheltered situations; light shade.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991). Status elsewhere unknown.

Helminthotheca echioides * (Picris echioides) ASTERACEAE

Ox-tongue

Life history

Growth form: Herb 30–100 cm high, with taproot.
Vegetative spread:
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow, October–November.
Fruit/seed: Achene 3 mm long, with pappus of bristles 5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, Africa.
Botanical subregions: CC SC CWS SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Wollongong.
Select locations: Mt Ousley Road (1967) only record for Sydney area.

Habitat

Habitat: Gravel dump.
Altitude: 0–400 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Minor weed, rare in Sydney area, mainly recorded from western NSW.

Hemizonia pungens * ASTERACEAE

Spikeweed

Life history

Growth form: Herb; glandular, hairy and aromatic.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, summer–autumn.
Fruit/seed: Achene 1–2 mm long with small apically offset horn.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to N America.
Botanical subregions: CT ST SWS.

Distribution Sydney area: Orange.
Select locations: Orange (1923) only record for Sydney area.

Habitat

Habitat: Pasturelands.
Altitude: 800 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Uncommon weed in the Orange, Culcairn and Canberra districts.

Hypochaeris glabra * ASTERACEAE

Smooth Catsear

Life history

Growth form: Herb 10–40 cm high with slender taproot.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, October–December.
Fruit/seed: Achene 3–5 mm long, of two types: inner with pappus of plumose bristles, outer with scabrous bristles, 8–10 mm long. Mature October–December.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms: Roots eaten by Sulphur-crested Cockatoo *Cacatua galerita* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, Africa.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; LHI, Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Sydney and lower Blue Mountains.
Select locations: Pennant Hills, Port Jackson (1882), Cooks River, Liverpool, Camden, Machins Crater, Bullio.

Habitat

Habitat: Lawns, pastures, woodland and disturbed habitats.
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Woodland, mown areas.
Substrate: Clay soils and sandy loam from shale, volcanic necks, fertile, well drained.
Exposure:

Conservation

Conservation: Common weed though not invasive of bushland.

Hypochaeris microcephala var. *albiflora* * ASTERACEAE

White Flatweed

Life history

Growth form: Herb 10–40 cm high, with radical leaves and a fleshy taproot.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, October–December.
Fruit/seed: Achene 5 mm long, with pappus of plumose bristles 5–8 mm long, mature October–December.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, also possibly spread in grain.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, Africa.
Botanical subregions: NC CC NWS NWP; Qld.
Distribution Sydney area: Sydney and Cumberland Plain
Select locations: Denistone, Concord (1965), Whalan, Mt Druitt, Camden.

Habitat

Habitat: Disturbed native vegetation and lawns, e.g. with *Hypochaeris radicata, Taraxicum officinale.*
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional–frequent.
Vegetation: Moist eucalypt forest, lawn.
Substrate: Clay soil from Wianamatta Shale, fertile. Watertable permanently low.
Exposure:

Conservation

Conservation: Weed of relatively recent introduction. Probably not invasive of bushland.

Hypochaeris radicata * ASTERACEAE

Catsear, Flatweed

Life history

Growth form: Herb 15–80 cm high with a basal rosette; growing from hard, thickened overwintering base, fibrous-rooted, but often with several enlarged roots and appearing tap-rooted (Turkington & Aarssen 1983).

Vegetative spread: Only by perennating buds, frequently multi-crowned in lawns; root segments do not regenerate without portion of the crown (Turkington & Aarssen 1983).
Longevity: Several years?
Primary juvenile period: Flowering plants can be produced from seed in 2 months (Turkington & Aarssen 1983).
Flowers: Yellow, at any time with peaks in June and November. Cross-pollinated and self-incompatible; sunlight essential for flower-opening — once open cannot close for at least 3 hours (Turkington & Aarssen 1983).
Fruit/seed: Achene 4–7 mm long, with plumed pappus 8–14 mm long, mature at any time.

Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, probably over long distances. Animal-dispersed (Carr et al. 1992). Coloniser of disturbed sites. Usually found as isolated rosettes, or small group probably clonal; light required for germination 33–94% from fresh seed, no dormancy; over-winters as basal rosette; true hemicrytophyte; mowing and grazing appears to stimulate growth of new leaves and favour flowering and fruiting in N.Z. (Turkington & Aarssen 1983). Grazing by snails *Helix aspersa* infuences plant size variability (Weiner 1993).
Fire response: Regrows from surviving rootstocks, seedlings recorded less than 1 year after fire (Purdie 1977). Resprouted, flowering and fruiting within 10–13 weeks of high-intensity fire (1/1994) at Lane Cove and Narrabeen (P. Kubiak pers. comm.).

Interaction with other organisms: May have allelopathic effects on other plant species inducing reduced shoot growth rate, also autotoxic (Turkington & Aarssen 1983). Palatable to rabbits (Leigh et al. 1987). Flowers eaten by Galah *Cacatua roseicapilla*, roots eaten by Sulphur-crested Cockatoo *Cacatua galerita*, flowers eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993). (For list of insect predators see Turkington & Aarssen 1983.)

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS SWP NFWP SFWP; LHI, Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Chatswood, Centennial Park, Lady Robinsons Beach (1887), Berry, Parramatta, Elderslie, Medlow Bath, Bathurst, Orange, Wildes Meadow.

Habitat

Habitat: Lawns, gardens, roadsides, pastures, swamp margins, disturbed habitats.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm

Typical local abundance: Frequent
Vegetation: Grassland and disturbed forest, but found on swamp margins (P. Kodela pers. comm.).
Substrate: Clay to sandy soils, from shale, basalt, sandstone, coal waste, fertile–infertile. Drought-tolerance related to deep rooting, found on well-drained sites, absent from waterlogged sites, tolerant of nutrient-deficient soils, has some degree of salt-tolerance (Turkington & Aarssen 1983).
Exposure: Full sun.

Conservation

Conservation: Widespread and common weed on edges of disturbed native vegetation and capable of invasion into open grassland areas and along tracks. Neutral to slightly alkaline soil conditions aid invasion of bushland (R. Buchanan pers. comm.).

Isoetopsis graminifolia ASTERACEAE

Grass Cushion

Life history

Growth form: Herb to 5 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellowish.
Fruit/seed: Achene 2 mm long, with outer hairs and scales, inner achenes aborted.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST NWS CWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Winburndale.
Select locations: Winburndale (1977) only Sydney area record.

Habitat

Habitat:
Altitude: 1000 m **Annual rainfall:** 1000 mm
Typical local abundance: Rare.
Vegetation: With herbaceous species, e.g. *Helipterum australe, Anguillaria, Plantago, Ophioglossum.*
Substrate: Sandy to loamy red earths.
Exposure:

Conservation

Conservation: Chiefly a western species, rare in Sydney area.

Lactuca saligna * ASTERACEAE

Willow-leaved Lettuce

Life history

Growth form: Herb 30–100 cm high, with long taproot.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow, October–May.
Fruit/seed: Achene 5–9 mm long, with pappus of bristles 3 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, Africa.

Botanical subregions: NC CC NT CT ST NWS CWS SWS SWP; LHI, Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Hornsby, Flemington, Penrith, Mt Wilson (1902), Bathurst.

Habitat

Habitat: Gardens, roadsides, wasteland, cultivation and degraded pastures.
Altitude: 0–1000 m **Annual rainfall:** 700–1300 mm
Typical local abundance:
Vegetation:
Substrate: Clay soils, cultivated sites. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Common weed but not invasive of bushland.

Lactuca serriola * ASTERACEAE

Prickly Lettuce

Life history

Growth form: Erect herb 1–2 m high, with long taproot.
Vegetative spread: No.
Longevity: Less than 2 years.
Primary juvenile period:
Flowers: Yellow, September–April.
Fruit/seed: Achene 6–8 mm long, with pappus of bristles 3 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms: Seed eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Bondi, Gladesville, Richmond, Penrith (1912), Camden, Abercrombie River, Robertson (P. Kodela pers. comm.), Moss Vale.

Habitat

Habitat: Gardens, roadsides, wasteland, cultivation and degraded pastures.
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Ephemeral weeds.
Substrate: Fertile soils, clay. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Minor weed.

Lagenifera gracilis ASTERACEAE

Slender Lagenophora

Life history

Growth form: Herb with short rhizome, roots fleshy.
Vegetative spread: No, rhizome short, vertical.
Longevity:
Primary juvenile period:
Flowers: White–purple, October–April.
Fruit/seed: Achene 2–3.5 mm long, no pappus, mature October–April, peak March.
Dispersal, establishment & growth: Diaspore: fruit.

Fire response: Probably resprouts at ground level or below.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC **CT**; Qld, Vic., Tas., S.A., Malesia.
Distribution Sydney area: Widespread at lower elevations.
Select locations: Watagans, MacDonald River, Dalrymple Hay NR, Scarborough, Bilpin, Berkshire Park, Kentlyn, Thirlmere, Albion Park, Kangaroo Valley.

Habitat

Habitat: Moist gullies and near water
Altitude: 0–600 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Various — moist open-forest, e.g. with *Eucalyptus saligna, Syncarpia glomulifera, Allocasuarina torulosa, Melaleuca* scrub and sedge moorland. Ground stratum.
Substrate: Sandy loam from shale enriched sandstone, or from shales. Soil fertile–infertile. Watertable mostly low, moisture supply continuous, fresh, sometimes seepage areas.
Exposure: In sheltered situations, mid–light shade.

Conservation

Conservation: Conservation status unknown.

Lagenifera stipitata ASTERACEAE

Blue Bottle-daisy, Common Lagenophora

Life history

Growth form: Stoloniferous herb to 40 cm high, roots fibrous.
Vegetative spread: Spreads by stolons.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, pale pink, bluish or mauve to purple, September–April, peak November–December.
Fruit/seed: Achene 2–4 mm long, no pappus, mature November–April.
Dispersal, establishment & growth: Diaspore: fruit, no special dispersal morphology (Westoby et al. 1990).
Fire response: Stems killed, resprouted from ground level and flowered within a month at Mona Vale after high-intensity fire (1/1994) (L.McD.). Resprouted, flowering within 9 weeks and seeds shed within 12 weeks of high-intensity fire at Lane Cove in 1994 (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT **CT** ST NWS; Qld, Vic., Tas., S.A., N.Z.
Distribution Sydney area: Coast and Upper Blue Mountains.
Select locations: Mooney Mooney Creek, Mona Vale (L.McD.), Austinmer, Seven Mile Beach, Culoul Range, Londonderry, Mt Tomah, Mt Cameron, Lithgow, Govetts Leap, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Moist sheltered sites.
Altitude: 0–1200 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Moist eucalypt open-forest, e.g. with *Eucalyptus deanei, E. cypellocarpa, E. fastigata, E. viminalis* with grassy understorey. Ground stratum.
Substrate: Basalt, shale, granite, talus, sandy loam. Soil very fertile–fertile. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: In sheltered places, mid-shade–full sun.

Conservation

Conservation: Conservation status unknown.

Leontodon taraxacoides subsp. *taraxacoides* * **ASTERACEAE**

Lesser Hawkbit

Life history

Growth form: Herb 15–40 cm high, with radical leaves.
Vegetative spread: No.
Longevity: 2–?5 years.
Primary juvenile period:
Flowers: Yellow, October–April.
Fruit/seed: Achene 5 mm long, with pappus of plumose bristles, mature October–April.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe. Cultivated at Royal Botanic Gardens in 1951 from seed removed as impurity from linseed apparently grown in Victoria.
Botanical subregions: NC CC SC NT **CT** ST SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Coast, western Sydney, Southern Highlands.
Select locations: Pittwater (1962), La Perouse, Yennora, Glenfield (1963), Casula, Doonside, Mt Druitt, Menangle, Camden, Wingecarribee Swamp (P. Kodela pers. comm.).

Habitat

Habitat: Lawns, wasteland, cemeteries, swamp margins (P. Kodela pers. comm.).
Altitude: 0–700 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Weedy areas, grassland,, e.g. with *Taraxicum officinale, Hyochaeris radicata.* Pasture/sedgeland ecotone (P. Kodela pers. comm.).
Substrate: Sandy soil, clayey soils from shale, possibly salt-tolerant? Damp swamp margin area (P. Kodela pers. comm.).
Exposure: Full sun.

Conservation

Conservation: Recently introduced weed species probably still spreading, but unlikely to invade bushland.

Leptinella longipes (Cotula longipes) **ASTERACEAE**

Life history

Growth form: Herb with prostrate branches.
Vegetative spread: Stoloniferous.
Longevity: Perennial.
Primary juvenile period:
Flowers: April.
Fruit/seed: Achene 1–2.5 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT; Qld, Vic., Tas.
Distribution Sydney area: Mainly coastal.
Select locations: Woy Woy, Narrabeen, Dee Why, Manly, Botany, Rockdale, Stanwell Park, Mt Kembla, Jenolan Caves (1900).

Habitat

Habitat: Swamps.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Swamps, lagoon margins.
Substrate: Poorly-drained sites, possibly salt-tolerant?
Exposure:

Conservation

Conservation: Rare, last collected in Sydney area in 1950, (at Dee Why) .

Leptorhynchos elongatus ASTERACEAE

Life history

Growth form: Herb to 40 cm high, with woody taproot.
Vegetative spread:
Longevity: Short, perennial.
Primary juvenile period:
Flowers: White–pale yellow, November.
Fruit/seed: Achene with pappus of bristles, mature November.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST NWS CWS SWS; Vic., Tas., S.A., W.A.
Distribution Sydney area: Western parts of area.
Select locations: Jenolan Caves (1899) only Sydney area record.

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Woodland and grassland.
Substrate:
Exposure:

Conservation

Conservation: Rare, no recent records for Sydney area.

Leptorhynchos nitidulus ASTERACEAE

Life history

Growth form: Slender, stoloniferous herb to 25 cm high.
Vegetative spread: Stoloniferous.
Longevity:
Primary juvenile period:
Flowers: Yellow, summer–autumn.
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC CT; Vic., Tas.
Distribution Sydney area: Hurstville–Yennora, Bathurst.
Select locations: Hurstville (1895), Auburn (1888), Yennora (1965), Bathurst (19th century).

Habitat

Habitat: Forests, clearings and roadsides.
Altitude: 0–800 m **Annual rainfall:** above 1000 mm
Typical local abundance:
Vegetation: Woodland with shrubby understorey, e.g. *Callistemon pinifolius, Chorizema parvifolium, Pultenaea pedunculata,* sometimes swampy areas.
Substrate: Sandy clay soil from Wianamatta Shale.
Exposure:

Conservation

Conservation: Northern limit (Auburn), rare and probably extinct in Sydney area and at Bathurst.

Leptorhynchos squamatus subsp. *A* ASTERACEAE

Scaly Buttons

Life history

Growth form: Herb to 25 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: October–December (limited data).
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Willis and Groves report: Optimal germination regime 20°/10°C. Effect of light on germination — nil. No strong after-ripening requirement. Germination inhibited by high temperature and cold stratification (Willis & Groves 1991).
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT ST NWS CWS SWS SWP; Vic., Tas., S.A., W.A.
Distribution Sydney area: Western Blue Mountains.
Select locations: Canobolas (1908), Hartley Vale (1913), Moss Vale (1915), Cordeaux Creek, Tuena.

Habitat

Habitat: Creek bank.
Altitude: 400–1400 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation: Grasslands and forests. Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Rare, mostly old records (5 specimens).

Leucanthemum vulgare subsp. *maximum* * ASTERACEAE

Oxeye Daisy

Life history

Growth form: Erect, herb 30–90 cm high.
Vegetative spread: Extensive creeping roots produce new aerial growth annually (Parsons & Cuthbertson 1992).
Longevity: Perennial.
Primary juvenile period: More than 1 year (Parsons & Cuthbertson 1992).
Flowers: White, disc bright yellow, November–February.
Fruit/seed: Achene 2.5 mm long. Seed produced in summer after which the aerial growth dies back; seed production is prolific, most seed is viable even after passing through the digestive tract of animals (Parsons & Cuthbertson 1992).
Dispersal, establishment & growth: Diaspore: fruit. No special adaptions for dispersal but small seeds spread in mud on animals and vehicles, water, grain; wind-dispersed along roadsides possibly assisted by turbulence from heavy vehicles (A. Rodd pers. comm.); germination in autumn, develops slowly during winter and spring, an extensive root system develops with shallow laterals which produce new aerial growth each autumn; some seed remains dormant for at least 20 years (Parsons & Cuthbertson 1992). Tolerates infrequent mowing.
Fire response:
Interaction with other organisms: Grows so densely it excludes most other vegetation, not readily grazed by stock so reduces carrying capacity of farmland (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to Europe. Introduced as garden ornamental, naturalised in Victoria by 1905 and since then in NSW (Parsons & Cuthbertson 1992).
Botanical subregions: NC NT CT ST; Vic., S.A., Tas.

Distribution Sydney area: Tablelands.
Select locations: Lawson (1911), Mt Wilson (1914), Kowmung River, Orange (1906), Fitzroy Falls, Robertson (P. Kodela pers. comm.), Wildes Meadow, Belanglo.

Habitat

Habitat: Roadsides and cleared land, creek channels, disturbed sites.
Altitude: 200–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Woodland, roadsides, and pastures.
Substrate: Sandstone, basalt, alluvium, fertile–infertile soil. Watertable mostly low. Heavy, damp soil (Parsons & Cuthbertson 1992).
Exposure:

Conservation

Conservation: 'Dreaded pest' at Mt Wilson where it has already rendered useless large areas of land (J.H. Maiden 1914). Presently spread along Bells Line of Road as far as Mt Tomah and probably still spreading (A. Rodd pers. comm. 1994).

Leucochrysum albicans subsp. ***albicans*** var. ***tricolor*** ASTERACEAE

Life history

Growth form: Woolly herb with woody rootstock, to 45 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Pale brown–white, October–April, peak October.
Fruit/seed: Achene 2–3 mm long with pappus of feather-like bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST CWS; Vic., Tas.
Distribution Sydney area: West of area.
Select locations: Hill End, Abercrombie, Trunkey Creek, Picton–Mittagong, Berrima, Wingello, Tallong.

Habitat

Habitat:
Altitude: 600–1000 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation:
Substrate: Sandstone and other sedimentary rock, deep soils.
Exposure:

Conservation

Conservation: Mostly old collections. Conservation status unknown.

Leucochrysum albicans subsp. ***albicans*** var. ***albicans*** ASTERACEAE

(Helipterum albicans)

Life history

Growth form: Woolly herb with woody rootstock to 45 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Pale brown–yellow, August–April.
Fruit/seed: Achene 2–3 mm long with pappus of feather-like bristles, mature March (limited data).
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Willis and Grove (1991) report: Optimal germination regime 20°/10°C (90–80 %). No effect of light on

germination. No strong after ripening requirement. Dormancy broken by GA_3, high temperature, cold-stratification.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC NT CT ST NWS CWS SWS NWP SWP NFWP; Qld, Vic., Tas.
Distribution Sydney area: Bathurst area.
Select locations: Jenolan Caves (1899), Hartley Vale, Zig Zag, Megalong Creek, Kirkconnel/Bowenfels (1904).

Habitat

Habitat:
Altitude: 700–1000 m **Annual rainfall:** 600–1000 mm
Typical local abundance: Now rare in area.
Vegetation: Grasslands and tall forests. Ground stratum.
Substrate: Shallow soil over sandstone, clay soils, infertile.
Exposure:

Conservation

Conservation: Rare — mostly old records (8 specimens). Conservation status unknown.

Leucochrysum graminifolium (Helipterum albicans var. graminifolium) ASTERACEAE

Life history

Growth form: Erect, tufted herb with woody rootstock, to 20 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, November–July.
Fruit/seed: Achene 2–3 mm long with pappus of feather-like bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CT.
Distribution Sydney area: Newnes Plateau.
Select locations: Wolgan Gap, Newnes Plateau, Glowworm Tunnel, Zig Zag, Clarence.

Habitat

Habitat: Rock outcrops, crevices, ironstone shelves and ledges.
Altitude: above 900 m **Annual rainfall:** 900–1100 mm
Typical local abundance: Frequent–occasional.
Vegetation: Open-heath, scrub and woodland; Pagoda rock complex of Benson & Keith 1990.
Substrate: Skeletal sandy soil or dry peaty soil on sandstone, among 'pagoda' rock formations.
Exposure:

Conservation

Conservation: Endemic to Newnes Plateau, conservation status unknown, habitat possibly vulnerable to cliff collapse due to underground mining.

Madia sativa * ASTERACEAE

Tarweed, Pitchweed

Life history

Growth form: Herb to 2 m high, hairy and strongly perfumed.
Vegetative spread: No.
Longevity: 1 year.

Primary juvenile period: Less than 1 year.
Flowers: Yellow, June–September.
Fruit/seed: Achene 4–5 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Chile and Argentina.
Botanical subregions: CT ST SWS; Vic.
Distribution Sydney area: South from Orange district.
Select locations: Orange (1918), Milthorpe (1953), Carcoar (1922).

Habitat

Habitat:
Altitude: above 800 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Naturalised weed, status unknown.

Matricaria matricarioides * (Chamomilla suaveolens) ASTERACEAE

Pineapple Weed

Life history

Growth form: Pineapple-scented herb 8–45 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Disc greenish yellow, no florets. Flowers spring–autumn; insect and self-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 1.2–1.5 mm long, pappus small, scarious.
Dispersal, establishment & growth: Dispersed by wind, animals and humans; germinates in spring (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms: Medicinal plant (Ciba-Geigy 1968–).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, S Africa and possibly N America.
Botanical subregions: CT CWS SWS; Vic., Tas., S.A.
Distribution Sydney area: Orange–Molong.
Select locations: Orange 1983 (only Sydney area record).

Habitat

Habitat: Roadsides, footpaths and disturbed sites.
Altitude: 800–1000 m **Annual rainfall:** 1000 mm
Typical local abundance: Occasional.
Vegetation:
Substrate: Loamy soils rich in nutrients (Ciba-Geigy 1968–).
Exposure:

Conservation

Conservation: Appears to be locally naturalised weed. Status unknown.

Melanthera biflora (Wedelia biflora) ASTERACEAE

Life history

Growth form: Scrambling herb to 1 m high, with opposite leaves.
Vegetative spread: Limited spread possible by rooting at nodes.
Longevity: Perennial.
Primary juvenile period:

Flowers: Yellow, December–April.
Fruit/seed: Achene 2–4 mm long, pappus absent or with 1–3 non-persistent bristles, 1 mm long, mature December–April.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Tertiary sand coloniser (Clarke 1989).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; LHI, Qld, N.T., Afr., Asia, Pac. I.
Distribution Sydney area: Sea coasts.
Select locations: Maroubra Bay, Cronulla, Werong, Otford, Burning Palms, Shellharbour.

Habitat

Habitat: Beach and rocky slopes near beaches.
Altitude: 0–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Coastal herbland, e.g. with *Lomandra longifolia, Scaevola calendulacea, Hydrocotyle bonariensis.*
Substrate: Sand dunes, foredune and backdune, shale embankments.
Exposure: Tolerant of sun and shade (Clarke 1989).

Conservation

Conservation: Conservation status unknown.

Microseris lanceolata ASTERACEAE

Life history

Growth form: Herb with fleshy, tuberous root.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, September–November.
Fruit/seed: Achene 8–10 mm long, with pappus of scales.
Dispersal, establishment & growth:
Fire response: Probably resprouts at ground level or below.
Interaction with other organisms: Tubers were food source for Aborigines. Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Bathurst–Orange area.
Select locations: Rylstone, Mullion Range, Hill End, Abercrombie Caves, Barbers Creek.

Habitat

Habitat: Steep rocky hillsides.
Altitude: 600–1000 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland, e.g. *Eucalyptus macrorhyncha, E. polyanthemos, E. nortonii, Angophora floribunda.*
Substrate: Sandy, infertile soil. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Conservation status unknown. Possibly needing local conservation?

Olearia argophylla ASTERACEAE

Native Musk, Silver Shrub

Life history

Growth form: Shrub or small tree to 9 m high, with alternate leaves; musky scent (Floyd 1983). Chromosome number: N = 54 (N. Lander pers. comm.).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, September–April.
Fruit/seed: Achene with pappus of bristles. Matures December (Floyd 1989).
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Foodplant of moth caterpillar *Anthela acuta*; pupation occurs in the foliage or under bark (Coupar & Coupar 1992). Timber could be used for cabinet work but usually too small (Floyd 1983).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Vic., Tas.
Distribution Sydney area: Western Blue Mountains, Southern Highlands, Illawarra.
Select locations: Gosford (1888), Mt Kembla, Macquarie Pass, Robertson, Minnamurra Falls, Mt Tomah, Kanangra Walls, Mt Werong, Hilltop, Kangaroo Valley.

Habitat

Habitat:
Altitude: 0–1200 m **Annual rainfall:** above 1000 mm
Typical local abundance:
Vegetation: Tall eucalypt forest, e.g. with *Eucalyptus fastigata, E. radiata, E. dalrympleana* or rainforest margins, e.g. associated with *Eucryphia moorei, Doryphora sassafras* and *Atherosperma moschatum* (Floyd 1983). Remnant patches of warm temperate/cool temperate rainforest at Robertson (P. Kodela pers. comm.).
Substrate: Fertile soils, well-drained but moist,, e.g. from Wianamatta Shale, basalt (P. Kodela pers. comm.).
Exposure:

Conservation

Conservation: Conservation status unknown.

Olearia asterotricha ASTERACEAE

Rough Daisy Bush

Life history

Growth form: Shrub to 2 m high, with alternate leaves. Chromosome number N = 9 (N. Lander pers. comm.).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, October–July.
Fruit/seed: Achene, silky; pappus of long bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CT; Vic.
Distribution Sydney area: Blue Mountains, Moss Vale.
Select locations: Wallerawang, Marangaroo, Katoomba, Megalong Valley, Bargo, Hilltop, Bowral, The Gib.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 900 mm

Typical local abundance:
Vegetation: Heath and eucalypt forest.
Substrate: Sandstone, soil infertile.
Exposure:

Conservation

Conservation: Status unknown.

Olearia burgessii ASTERACEAE

Life history

Growth form: Shrub to 1.8 m high, with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, July–November.
Fruit/seed: Achene, 2 mm long, with pappus of long bristles.
Dispersal, establishment & growth: Wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CT ST.
Distribution Sydney area: Thirlmere–Hilltop (also near Tumbarumba).
Select locations: Burragorang Lookout, Thirlmere, Tahmoor, Hilltop.

Habitat

Habitat:
Altitude: 200–600 m **Annual rainfall:** 900–1000 mm
Typical local abundance:
Vegetation: Dry sclerophyll forest.
Substrate: Sandy loam over sandstone or shale.
Exposure:

Conservation

Conservation: Rare, this species is known from two areas some 400 km apart and was last collected in 1971. It appears to warrant the category 3K of Briggs & Leigh 1988 (Lander 1991).

Olearia chrysophylla ASTERACEAE

Life history

Growth form: Shrub to 3 m high, with opposite leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, December–January.
Fruit/seed: Achene, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT CT.
Distribution Sydney area: Blue Mountains to Orange.
Select locations: Springwood, Jenolan Caves, Oberon, Sunny Corner.

Habitat

Habitat:
Altitude: 500–1000 m **Annual rainfall:** above 800 mm

Typical local abundance:
Vegetation: Sclerophyll forest.
Substrate: Granite.
Exposure:

Conservation

Conservation: Status unknown. Few collections, rare.

Olearia cordata ASTERACEAE

Life history

Growth form: Shrub to 2 m high, with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Deep blue–mauve, November–April.
Fruit/seed: Achene, silky, with pappus of bristles.
Dispersal, establishment & growth:
Fire response: Resprouts; many seedlings at Yengo (M. Matthes pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC.
Distribution Sydney area:
Select locations: Wollemi Creek, Big Yengo Track, Fernances Trig, St. Albans, Wisemans Ferry.

Habitat

Habitat: Sandstone rocky ridge
Altitude: 0–300 m **Annual rainfall:** 800–1000 mm
Typical local abundance: Occasional.
Vegetation: Dry open sclerophyll forest and open shrubland, e.g. with *Angophora bakeri, Eucalyptus eugenioides, E. punctata.*
Substrate: Low-nutrient soils from sandstone, possibly with shale influence.
Exposure:

Conservation

Conservation: A rare local endemic, coded 2RCa by Briggs & Leigh (1988). Known populations appear to be conserved.

Olearia elliptica ASTERACEAE

Sticky Daisy Bush

Life history

Growth form: Shrub to 2 m high, with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, November–May.
Fruit/seed: Achene, with pappus of long bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT NWS CWS NWP; LHI, Qld.
Distribution Sydney area: Widespread.
Select locations: Killara, Stanwell Park, Mt Kembla, Jamberoo, Yerrinbool, Wentworth Falls, Mt Victoria, Carrington Falls, Bundanoon.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Heath, woodland and sclerophyll forest.
Substrate: Sandy or dark silty soils.
Exposure:

Conservation

Conservation: Status unknown.

Olearia erubescens ASTERACEAE

Silky Daisy Bush

Life history

Growth form: Shrub 2 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, September–March.
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Vic.,Tas., S.A.
Distribution Sydney area: Blue Mountains.
Select locations: Glenbrook, Yerranderie, Springwood, Leura, Katoomba, Blackheath, Mt Banks, Clarence, Mittagong.

Habitat

Habitat:
Altitude: 0–1200 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Dry eucalypt forest.
Substrate:
Exposure:

Conservation

Conservation: Status unknown but possibly rare. 60% of specimens collected pre 1940.

Olearia glandulosa ASTERACEAE

Life history

Growth form: Shrub to 1.5 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, November–June.
Fruit/seed: Achene, silky; pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST; Tas., S.A., W.A.
Distribution Sydney area: Mittagong southwards.
Select locations: Wingecarribee Swamp, Hanging Rock Swamp (near Penrose). (Other specimens not available)

Habitat

Habitat: Near moist gullies, swamps, river banks.
Altitude: 600–700 m **Annual rainfall:** above 1000 mm
Typical local abundance: Rare–occasional.
Vegetation: Woodland, wet heathlands or sedgelands. Amongst sedges and other herbs (P. Kodela pers. comm.).
Substrate: Peat, tolerates wetness.
Exposure: Observed growing in full sun (P. Kodela pers. comm.).

Conservation

Conservation: Conservation status unknown.

Olearia megalophylla ASTERACEAE

Life history

Growth form: Shrub to 2 m high, with alternate or opposite leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, December–March.
Fruit/seed: Achene, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST SWS; Vic.
Distribution Sydney area: Widespread but rare.
Select locations: Port Kembla, Bargo, Jenolan Caves, Canobolas SF.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation: Moist eucalypt forest.
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown, rare. Orange is northern limit.

Olearia microphylla ASTERACEAE

Snow Bush

Life history

Growth form: Shrub to 2 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, June–October.
Fruit/seed: Achene with pappus of long bristles, mature June–October.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed, possibly colonising disturbed sites.
Fire response: Mostly killed, only 1 plant observed resprouting from base after high-intensity fire, no seedlings (1/1994) at Lane Cove ; probably also killed by moderate-intensity fire, flowering after moderate–high-intensity fire, most of the viable soil-stored seed probably destroyed by very high-intensity fire (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.

Botanical subregions: NC CC SC NT CT ST NWS CWS; Qld.
Distribution Sydney area: Widespread.
Select locations: Gordon, Lane Cove, Rookwood, Chester Hill, Campbelltown, Port Hacking, Austinmer, Hilltop, The Gib, Bundanoon.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Sclerophyll forest, e.g. with *Eucalyptus sieberi*, *E. sclerophylla*, and heathy scrub.
Substrate: Sandy soils on sandstone, also sandy clay soils, low nutrient.
Exposure:

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Olearia myrsinoides ASTERACEAE

Blush Daisy Bush

Life history

Growth form: Shrub to 1.5 m high, with alternate leaves.
Vegetative spread: Possibly root suckers.
Longevity:
Primary juvenile period:
Flowers: White and violet or pale yellow, November–March.
Fruit/seed: Achene with pappus of bristles.
Dispersal, establishment & growth:
Fire response: Possibly resprouts from root suckers.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Vic., Tas.
Distribution Sydney area: Mainly upper Blue Mountains.
Select locations: Glenbrook, Wentworth Falls, Blackheath, Mt York, Clarence, Portland, Rylstone.

Habitat

Habitat: Eucalypt woodland.
Altitude: 0–1200 m **Annual rainfall:** above 1000 mm
Typical local abundance: Occasional.
Vegetation: Open grassland, eucalypt woodlands and swampy areas, e.g. with *Eucalyptus sieberi*, *E. oreades*, *E. dives* (Newnes Plateau Woodland of Benson & Keith 1990).
Substrate: Sandstone soils, medium nutrients.
Exposure:

Conservation

Conservation: Conservation status unknown.

Olearia nernstii ASTERACEAE

Life history

Growth form: Shrub to 2 m high, with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, March–November.
Fruit/seed: Achene, with pappus of long bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT; Qld.
Distribution Sydney area: Mainly Gosford–Wyong.
Select locations: Wyong Creek (1893), Ourimbah (1911), Gosford (1888), Yerranderie (1916).

Habitat

Habitat:
Altitude: 0–200 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation: Eucalypt forest and open woodland.
Substrate: Probably clay soils.
Exposure:

Conservation

Conservation: Southern limit, old collections only. Now probably rare in Sydney area.

Olearia oliganthema ASTERACEAE

Life history

Growth form: Shrub with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow.
Fruit/seed: Achene.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT.
Distribution Sydney area: Blue Mountains.
Select locations: Collected twice from 'Blue Mountains' before 1866, and not recorded since (Leigh et al. 1984).

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Unknown, possibly eucalypt open-forest.
Substrate: Unknown, but possibly on shale soil.
Exposure:

Conservation

Conservation: Coded 2X, extinct (Briggs & Leigh 1988), last collected 1866.

Olearia phlogopappa ASTERACEAE

Life history

Growth form: Shrub to 1 m high, with alternate leaves. Chromosome number N = 9 (N. Lander pers. comm.).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, November–March.
Fruit/seed: Achene with pappus of long bristles.
Dispersal, establishment & growth:
Fire response:

Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas.
Distribution Sydney area: Blue Mountains and Southern Highlands.
Select locations: Leura Gap, Burragorang, Carrington Falls, Kangaroo River Bridge.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance:
Vegetation: Eucalypt woodland, forest and heath.
Substrate:
Exposure:

Conservation

Conservation: Possibly rare, conservation status unknown.

Olearia quercifolia ASTERACEAE

Life history

Growth form: Shrub to 2 m high, with alternate leaves.
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: White, July, November–December.
Fruit/seed: Achene, silky, with pappus of long bristles.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT.
Distribution Sydney area: Upper Blue Mountians.
Select locations: Mt Wilson, Mt Tomah, Newnes Plateau.

Habitat

Habitat: Swampy or moist terrain.
Altitude: 800–1200 m **Annual rainfall:** above 1000 mm
Typical local abundance: Occasional.
Vegetation: Margins of shrub swamps, e.g. Newnes Plateau Shrub-swamps (Benson & Keith 1990).
Substrate: Peaty soils on sandstone, periphery of swamps, very infertile, watertable mostly high.
Exposure: Full sun–light shade.

Conservation

Conservation: Restricted local endemic, coded 3RC in Briggs & Leigh (1988), vulnerable to changes in water flow and water quality and in its swamp habitat.

Olearia ramosissima ASTERACEAE

Life history

Growth form: Shrub to 1.3 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Blue–mauve, June–August.
Fruit/seed: Achene, silky, with pappus of 27–47 long bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CT NT NWS SWP; Qld, W.A.
Distribution Sydney area: Shoalhaven River gorge (Harden 1992).
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Sclerophyll forest (Harden 1992).
Substrate:
Exposure:

Conservation

Conservation:

Olearia ramulosa ASTERACEAE

Life history

Growth form: Shrub to 1.6 m high, scabrous, pubescent, sometimes sticky. Chromosome number N = 9 (N. Lander pers. comm.).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Pale blue or mauve or white, October–May. Insect-pollinated (Sulman 1914).
Fruit/seed: Achene, with pappus of 20–40 long bristles.
Dispersal, establishment & growth: Wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Vic., Tas., S.A.
Distribution Sydney area: Widespread.
Select locations: Specimens unavailable.

Habitat

Habitat: Hilly terrain (Harden 1992).
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Tall open-forest.
Substrate: Shales, medium to high nutrient.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Olearia rosmarinifolia ASTERACEAE

Life history

Growth form: Shrub to 1.6 m high, hoary or silvery.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, October–December.
Fruit/seed: Achene, with pappus of 60–84 bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST NWS CWS; Qld.
Distribution Sydney area: Western parts of area.
Select locations: Specimens unavailable.

Habitat

Habitat: Rocky areas around riverbeds and gorges (Harden 1992).
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation:

Olearia stellulata (Olearia lirata) ASTERACEAE

Life history

Growth form: Shrub to 3 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, August–January.
Fruit/seed: Achene, silky, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST; Vic., Tas.
Distribution Sydney area:
Select locations: Specimens unavailable.

Habitat

Habitat: Hillsides and creekbanks (Harden 1992).
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Sclerophyll forest (Harden 1992).
Substrate:
Exposure:

Conservation

Conservation:

Olearia suffruticosa ASTERACEAE

Life history

Growth form: Shrub to 0.7 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White or pink, January–May.
Fruit/seed: Achene, silky, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.

Botanical subregions: CT; Vic., S.A.
Distribution Sydney area:
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation:

Olearia tenuifolia ASTERACEAE

Life history

Growth form: Shrub to 2 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Blue or mauve, at any time of year.
Fruit/seed: Achene, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: SC CT ST CWS SWS SWP; Vic.
Distribution Sydney area:
Select locations: Specimens unavailable.

Habitat

Habitat: Rocky areas (Harden 1992).
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Dry sclerophyll forest, mallee and woodland (Harden 1992).
Substrate:
Exposure:

Conservation

Conservation:

Olearia tomentosa ASTERACEAE

Life history

Growth form: Shrub to 2 m high with alternate leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Blue or white, August–May.
Fruit/seed: Achene, with pappus of bristles.
Dispersal, establishment & growth:
Fire response: Probably most killed by high-intensity fire (1/1994) at Narrabeen, a few suckering plants observed (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC CT ST.

Distribution Sydney area: Widespread including exposed headlands on coast.
Select locations: Listed in national park areas from Brisbane Water NP to Sydney Harbour NP. Barrenjoey headland and Mona Vale (L.McD.). Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Dry sclerophyll forest, scrub and heath (Harden 1992).
Substrate: Sandstone
Exposure:

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991).

Olearia viscidula ASTERACEAE

Wallaby Weed

Life history

Growth form: Viscid shrub to 2.5 m high with alternate or opposite leaves.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, July–November.
Fruit/seed: Achene, silky, with pappus of 27–37 long bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS; Vic.
Distribution Sydney area: Coast to Blue Mountains.
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation: Eucalypt tall open-forest and rainforest. Dry sclerophyll forest and eucalypt woodland (Harden 1992).
Substrate: Medium-high nutrient soils.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Onopordum acanthium subsp. *acanthium* * ASTERACEAE

Scotch Thistle

Life history

Growth form: Biennial herb to 1 m high.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period:
Flowers: Florets purple, September–December.
Fruit/seed: Achene 4–5 mm long, with pappus of barbed bristles 7–9 mm long.
Dispersal, establishment & growth: Diaspore fruit, wind-dispersed. Pioneer species, establishing on bare soil after, e.g. roadbuilding or soil erosion (Doing et al. 1969).
Fire response:
Interaction with other organisms: Foodplant of butterfly caterpillar *Vanessa kershawi* (Coupar & Coupar 1992). Weevil *Larinus latus* the first biological control agent for *Onopordum* spp., released in 1992, destroys seeds (Tanner 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC NT CT ST CWS SWS NWP SWP SFWP; Vic., Tas., S.A.
Distribution Sydney area: Flemington, Orange.
Select locations: Flemington Saleyards (1968, 1980), Orange (1941).

Habitat

Habitat: Cultivated areas, saleyards.
Altitude: 0–1000 m **Annual rainfall:** 1000 mm
Typical local abundance: Rare.
Vegetation: Thistle communities, roadside and riverbank vegetation mainly with *Cirsium vulgare, Carduus nutans, C. tenuiflorus, C. pycnocephalus, Silybum marianum* or grassland communities with *Hordeum leporinum, Bromus diandrus, B. hordeaceus* etc. (Doing et al. 1969).
Substrate: Replaces *Carduus nutans* on limestone and coarse sandy soils, fertile soils with moisture holding capacity (Doing et al. 1969).
Exposure:

Conservation

Conservation: Naturalised weed, declared noxious in many shires of NSW.

Osteospermum ecklonis * ASTERACEAE

Life history

Growth form: Shrub or subshrub to 100 cm high.
Vegetative spread: Appears to root along stems.
Longevity:
Primary juvenile period:
Flowers: White and blue-violet, disc azure blue, April–December.
Fruit/seed: Achene 7 mm long, no pappus.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa, introduced as garden ornamental.
Botanical subregions: CC; Qld.
Distribution Sydney area: Suburban areas.
Select locations: Blackwall Mtn, Palm Beach, Cheltenham, Ingleburn, Macquarie Fields (1941), Campbelltown, Orangeville.

Habitat

Habitat: Footpaths, wasteland, beaches, roadsides.
Altitude: 0–300 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Wasteland weeds.
Substrate: Sandy soils, e.g. beaches, and loamy soils from shales, low–moderately fertile.
Exposure: Full sun.

Conservation

Conservation: Probably mainly localised garden escape from rubbish dumping.

Ozothamnus adnatus (Helichrysum adnatum) ASTERACEAE

Life history

Growth form: Heath-like shrub 1–2 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Cream, October–December.
Fruit/seed: Achene with pappus of bristles, November–January.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT CT ST; Vic.
Distribution Sydney area: Coast and Blue Mountains.
Select locations: Hurstville (1900), Oatley, Waterfall, Thirlmere Lakes, Glenbrook, Scotts Main Range, Bullaburra, Katoomba, Moorara Boss, Jenolan Caves, Hilltop.

Habitat

Habitat: Hillsides.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional–rare.
Vegetation: Dry eucalypt forest, e.g. with *Syncarpia glomulifera, Eucalyptus gummifera, E. punctata, E. sieberi, E. sideroxylon.*
Substrate: Sandy to sandy loam to shaley soils from sandstone, infertile. Watertable mostly low.
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Ozothamnus argophyllus (Helichrysum argophyllum) ASTERACEAE

Life history

Growth form: Aromatic shrub to 2.5 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Spring–summer. October–November.
Fruit/seed: Achene with pappus of bristles, mature December.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST; Vic., Tas., S.A.
Distribution Sydney area: Coast.
Select locations: Pearl Beach, Mt Kembla, Shellharbour (1899), Berry, Kangaroo Valley, Robertson, Bombaderry.

Habitat

Habitat: Eucalypt forest and edge of rainforest.
Altitude: 0–600 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation: Tall eucalypt forests, edge of rainforest.
Substrate: High nutrient soils, basalt.
Exposure:

Conservation

Conservation: Conservation status unknown.

Ozothamnus diosmifolius (Helichrysum diosmifolium) ASTERACEAE

White Dogwood

Life history

Growth form: Much branched shrub to 5 m high with white flowers.
Vegetative spread: No.
Longevity: Probably medium.
Primary juvenile period:
Flowers: White or pink, October–January, peak November.
Fruit/seed: Achene with pappus of fine hairs, matures December–January.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed (Westoby et al. 1990).
Fire response: Resprouted at Agnes Banks (Benson 1981). Most killed by high-intensity fire

(1/1994) at Lane Cove, a few scattered plants resprouted from base and some plants resprouted from stems after lower fire intensities, scattered occurrence of seedlings (P. Kubiak pers. comm.).
Interaction with other organisms: Known to cause severe contact allergy in humans (Bass 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS NWP SWP; Qld.
Distribution Sydney area: Widespread.
Select locations: Howes Mountain, Spencer, Cheltenham, Otford, Minamurra Falls, Kurrajong, St Marys, Yerranderie, Hill Top, Mt Corricudgy, Kandos, Wildes Meadow (P. Kodela pers. comm.).

Habitat

Habitat: Open-forest, a tall open-forest.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Tall moist forests, e.g with *Eucalyptus saligna, E. cypellocarpa or E. fastigata*, to dry forests, e.g. with *Eucalyptus fibrosa, E. tereticornis*.
Substrate: Clay soils, fertile, from Wianamatta Shale, volcanics, sometimes sandstones. Recorded on saline soils near Lower Boro (Kodela & Foster 1990).
Exposure:

Conservation

Conservation: Probably adequate. Conserved in Western Sydney (Benson & McDougall 1991).

Ozothamnus ferrugineus (Helichrysum dendroideum) ASTERACEAE

Tree Everlasting

Life history

Growth form: Erect shrub or small tree 2–5 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Summer–autumn.
Fruit/seed: Achene, with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed locally.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT; Vic., Tas., S.A.
Distribution Sydney area: Mainly upper Blue Mountains.
Select locations: Kiama (1888), Mt Coricudgy, Mt Tomah, Jenolan Caves Road, Mt Murray, Foxground, Bundanoon.

Habitat

Habitat: Ridges and hillsides.
Altitude: 0–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Open eucalypt forest and scrub.
Substrate: Basalt soil, high nutrient.
Exposure:

Conservation

Conservation: Conservation status unknown.

Ozothamnus rosmarinifolius (Helichrysum rosmarinifolium) ASTERACEAE

Life history

Growth form: Shrub to 1.5 m high.
Vegetative spread:
Longevity: ?
Primary juvenile period:
Flowers: Golden, January–February.
Fruit/seed: Achene with pappus of bristles, mature February.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST; Vic., Tas.
Distribution Sydney area: Jenolan–Oberon area.
Select locations: Jenolan Caves (1899), Boyd River, Duckmaloi River, Gurnang SF.

Habitat

Habitat:
Altitude: 800–1200 m **Annual rainfall:** 800–1000 mm
Typical local abundance:
Vegetation: Eucalypt forest, often beside water courses.
Substrate:
Exposure:

Conservation

Conservation: Conservation status unknown.

Picris hieracioides * ASTERACEAE

Hawkweed Picris

Life history

Growth form: Erect herb 30–80 cm high.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period:
Flowers: Yellow, most of the year.
Fruit/seed: Achene 6–9 mm long, with pappus of plumed bristles 8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia, Africa.
Botanical subregions: NC CC SC NT ST NWS NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Colo River area.
Select locations: Culoul Range (1976) only record for Sydney area.

Habitat

Habitat: Weed of disturbed areas.
Altitude: 600 m **Annual rainfall:** 800 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation:

Podolepis canescens ASTERACEAE

Large Copper-wire Daisy

Life history

Growth form: Woolly herb to 80 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Straw-coloured, March.
Fruit/seed: Achene 2 mm long, with pappus of bristles.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT CWS NWP SWP NFWP SFWP; Vic., N.T., S.A., W.A.
Distribution Sydney area: Bathurst.
Select locations: Hill End (1885), Bathurst (1894, 1901) only records for Sydney area.

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 700 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare in area, possibly extinct.

Podolepis hieracioides ASTERACEAE

Life history

Growth form: Herb to 70 cm high, with long taproot.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, January–March.
Fruit/seed: Achene 3 mm long, with pappus of bristles, mature January–March.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic.
Distribution Sydney area: Mainly western Blue Mountains.
Select locations: Ben Bullen, Marrangaroo Creek, Little Hartley, Duckmaloi, Oberon/Jenolan Road, Burragorang Valley, Bargo River, Bowral.

Habitat

Habitat:
Altitude: 500–1200 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Moist eucalypt forest, e.g. with *Eucalyptus cypellocarpa, E. viminalis, E. radiata, E. ovata*, and grassland.
Substrate: Clay loam from shales and slatey shales.
Exposure:

Conservation

Conservation: Conservation status unknown (50% of Herbarium collections pre 1940).

Podolepis jaceoides ASTERACEAE

Showy Copper-wire Daisy

Life history

Growth form: Herb to 70 cm high, with several stems arising from perennial stock each year.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, August–January.
Fruit/seed: Achene 3 mm long, with pappus of bristles.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed
Fire response:
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Widespread.
Select locations: Otford, Mt Kembla, Nepean Dam Road, Thirlmere, Mt Victoria, Mt Werong, Moorara Boss, Bowral, Long Swamp.

Habitat

Habitat: 'Amongst grasses in open situations and forest land' (Davis 1956).
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassy woodland, e.g. with *Eucalyptus sieberi, E. blaxlandii, E. obliqua* and grassy slopes of swamp margins.
Substrate: Sandy to clay soil from shale, granite, fertile–infertile.
Exposure:

Conservation

Conservation: Status unknown but probably becoming increasingly rare.

Pseudognaphalium luteoalbum (Gnaphalium luteo-album) ASTERACEAE

Jersey Cudweed

Life history

Growth form: Erect, greyish–white, woolly herb to 45 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: At any time of year.
Fruit/seed: Achene 0.6 mm long, with pappus of bristles 3 mm long, mature September–May.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed locally. Coloniser.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A., almost cosmopolitan.
Distribution Sydney area: Coast and western Blue Mountains.
Select locations: Awaba, Hornsby, Como, Bulli Pass, Gerringong, Camden, Silverdale, Blackheath, Clarence, Mt Blaxland, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Grassland, watercourses, saltmarsh flats, swamps.
Altitude: 0–1100 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Grasslands and open areas, e.g. with *Juncus, Cyperus*. Swamps, pastures (P. Kodela pers. comm.).
Substrate: Sandy soils, infertile, watertable mostly high, fresh–? brackish. More fertile

situations in the Robertson area (P. Kodela pers. comm.).
Exposure: Full sun.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Rhodanthe anthemoides (Helipterum anthemoides) ASTERACEAE

Life history

Growth form: Erect, bushy herb with many slender stems arising from perennial rootstock.
Vegetative spread: Probably not.
Longevity: Possibly short-lived, less than 5 years.
Primary juvenile period:
Flowers: Pale brown, May–December.
Fruit/seed: Achene 2 mm long, with silky pappus.
Dispersal, establishment & growth: Diaspore: fruit, locally wind-dispersed. Seedling recruitment probably not fire-related though in subalpine habitats is common on exposed slopes especially after fire or disturbance (Burbidge & Gray 1976). Population at Mt Annan expanding in absence of grazing and fire.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT ST NWS CWS SWS ; Qld, Vic., Tas.
Distribution Sydney area: Southwestern Sydney.
Select locations: Bringelly, Mt Annan, Razorback.

Habitat

Habitat: Woodland.
Altitude: 0–300 m **Annual rainfall:** 700–800 mm
Typical local abundance: Frequent.
Vegetation: Grasslands and tall forests, woodland of *Eucalyptus moluccana–E. tereticornis* with grassy understorey. Ground stratum.
Substrate: Fertile, clay soils from Wianamatta Shale. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: Sheltered sites; light shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Rhodanthe pygmaea (Helipterum pygmaeum) ASTERACEAE

Pigmy Sunray

Life history

Growth form: Sparsely woolly herb to 6 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: August.
Fruit/seed: Achene 2.5 mm long, with pappus of bristles 5–7 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native in western NSW, but introduced to Central Coast.
Botanical subregions: CC* ST NWS CWS SWS NWP SWP NFWP SFWP; Vic., S.A., W.A.
Distribution Sydney area: Flemington.

Select locations: Flemington (1968) only record.

Habitat

Habitat: Saleyard.
Altitude: 0–100 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Probably introduced to Flemington from western NSW with stock, and now unlikely to occur there.

Roldana petasitis * (Senecio petasitis) ASTERACEAE

Life history

Growth form: Shrub or herb, mostly 1.5–2 m high, softy hairy.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, August–October.
Fruit/seed: Achene 2.5–4 mm long, with pappus of slender hairs 8–10 mm long, not persistent.
Dispersal, establishment & growth:
Fire response: Resprouted after high-intensity fire (1/1994) at Lane Cove, flowers in bud within 30 weeks (P. Kubiac pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mexico. Cultivated as an ornamental.
Botanical subregions: NC CC; LHI, Qld.
Distribution Sydney area:
Select locations: Galston (J. Howell), Epping, Lane Cove, Rookwood, Campbelltown (1969), Kembla Grange (1967), Macquarie Pass.

Habitat

Habitat: Roadsides, railway lines, disturbed areas.
Altitude: 0–300 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation: Tall eucalypt forest.
Substrate: Medium-nutrient soils, e.g. from Wianamatta Shale.
Exposure:

Conservation

Conservation: Occasionally naturalised.

Schkuhria pinnata var. *abrotanoides** ASTERACEAE

Dwarf Marigold

Life history

Growth form: Much-branched herb to 50 cm high.
Vegetative spread:
Longevity: Probably short-lived (1–2 years).
Primary juvenile period:
Flowers: Yellow, March–April.
Fruit/seed: Achene 4 mm long, with pappus of scales, mature April.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Chile.

Botanical subregions: NC CC NT NWS CWS NWP SWP; Qld, Vic.
Distribution Sydney area: Mainly western Sydney.
Select locations: Flemington, Miranda (1925), Dural, Rouse Hill, Doonside.

Habitat

Habitat: Disturbed sites and roadsides.
Altitude: 0–100 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation:
Substrate: Clay soils from Wianamatta Shale.
Exposure:

Conservation

Conservation: Naturalised roadside weed, rare.

Senecio amygdalifolius ASTERACEAE

Life history

Growth form: Herb or shrub, mostly 80–150 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: October. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 4–6 mm long, with pappus of hairs 8–10 mm long, mature November. Potential seed set/plant 500–1000; seed weight without pappus 1.85 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed. Germinates readily without treatment when fresh.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT NWS; Qld.
Distribution Sydney area: North from Morisset.
Select locations: Morisset (1959) only record for Sydney area.

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** 1100 mm
Typical local abundance: Frequent.
Vegetation: Open eucalypt forest, disturbed.
Substrate: High nutrient soils, disturbed sites.
Exposure:

Conservation

Conservation: Morisset (southern limit), conservation status unknown.

Senecio anacampserotis ASTERACEAE

Life history

Growth form: Herb, stems prostrate then erect, 15–50 cm long.
Vegetative spread: Creeping, rooting at nodes along stems.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, August–December.
Fruit/seed: Achene 5 mm long, with appressed white hairs and pappus 7–8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC; Tas.

Distribution Sydney area: Coastal.
Select locations: Wamberal, Dee Why Beach, Kurnell, Cronulla Beach.

Habitat

Habitat: Sand dunes and dune slacks.
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent–occasional.
Vegetation:
Substrate: Beach sand dunes, bare moist areas.
Exposure: Full sun.

Conservation

Conservation: Rare (60% of Herbarium records collected pre 1940). Conservation status unknown.

Senecio bipinnatisectus ASTERACEAE

Life history

Growth form: Erect shrub, 60–120 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: January–March. Probably native bee-pollinated, self-compatible (Lawrence 1985).
Fruit/seed: Achene 2 mm long, with pappus of hairs 5–6 mm long. Potential seed set/plant 5000–15 000 ; seed weight without pappus 0.22 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed (Westoby et al. 1990), mature March–May. Germination 70% (Lawrence 1985).
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST CWS; Qld.
Distribution Sydney area: Coast and higher mountains.
Select locations: Watagan, Asquith, Blakehurst (1903), Audley, Helensburgh, Mt Keira, Minnamurra, Thirlmere Lakes, Mt Tomah, Govetts Leap, Robertson.

Habitat

Habitat: Gullies, creek banks, swamp.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Rare–occasional.
Vegetation: Heath, woodland and forest.
Substrate: Sandy soils, alluvial, infertile, watertable mostly high, fresh.
Exposure: Mid–deep shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Senecio biserratus ASTERACEAE

Life history

Growth form: Erect herb, 50–100 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Most of year.
Fruit/seed: Achene 2 mm long, with pappus of hairs 5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT ST; Vic., Tas., S.A., N.Z.
Distribution Sydney area: Picton, Lithgow.
Select locations: Mt Walker (Lithgow), Blue Gum Creek (Picton).

Habitat

Habitat:
Altitude: 0–800 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Moist eucalypt forest, e.g. with *Eucalyptus deanei* or drier woodland, e.g. with *Eucalyptus dives, E. mannifera* (Mt Walker complex of Keith & Benson 1988).
Substrate: Soils on sandstone, siltstones or claystones, fertile–infertile, well-drained.
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Senecio crassiflorus * ASTERACEAE

Life history

Growth form: Decumbent herb with silvery white stems 20–50 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Throughout the year.
Fruit/seed: Achene 3–5 mm long, with pappus of hairs14–15 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America, introduced as garden ornamental.
Botanical subregions: NC CC.
Distribution Sydney area: Coast near habitation.
Select locations: Belmont (1947), Cowan (1924).

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate: Probably sandy soils.
Exposure:

Conservation

Conservation: Sometimes locally naturalised in coastal districts. Cowan–Berowra current southern limit of naturalised distribution.

Senecio diaschides ASTERACEAE

Life history

Growth form: Erect herb, 50–100 cm high.
Vegetative spread:
Longevity: Short-lived perennial.
Primary juvenile period:
Flowers: November–March.
Fruit/seed: Achene 2.5 mm long, with pappus of hairs 3–5 mm long, mature January–August.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response: Killed, seedlings grow vigorously after fire.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT ST NWS CWS; Qld, Vic., *W.A.
Distribution Sydney area: Widespread.
Select locations: Boarding House Dam, Hornsby, Many Reservoir, Malabar, Engadine, Culoul Range, Doonside, Wilton, Mt Tomah, Clarence, Glanmire, Rockley, Wildes Meadow (P. Kodela pers. comm.).

Habitat

Habitat: Forest, roadsides, creeks.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation: High rainfall eucalypt forest, e.g. with *Eucalyptus tereticornis*, *E. sieberi* or coastal heath with *Banksia integrifolia*.
Substrate: Usually damp places, clays soil, medium nutrient, from basalt, shale, also sandy soils.
Exposure:

Conservation

Conservation: Conservation status unknown.

Senecio glomeratus ASTERACEAE

Life history

Growth form: Erect herb mostly 30–100 cm high.
Vegetative spread: No.
Longevity: Short, 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Spring. Probably native bee-pollinated, self-compatible (Lawrence 1985).
Fruit/seed: Achene 1.3–1.7 mm long, with pappus of hairs 5 mm long. Potential seed set/plant 5000–10 000; seed weight without pappus 0.1 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 95% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC ST CWS SFWP; Vic., Tas., S.A., W.A.
Distribution Sydney area: La Perouse, Western Sydney.
Select locations: La Perouse (1965) only Herbarium record, Prospect (D.H.B.)

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Moist sites, probably on sandy soil from sandstone.
Exposure:

Conservation

Conservation: Not common, vulnerable in Western Sydney (Benson & McDougall 1991). Status elsewhere unknown.

Senecio hispidulus var. *dissectus* ASTERACEAE

Life history

Growth form: Erect herb, mostly 30–100 cm high, with lower leaves pinnatifid, upper leaves pinnatisect to bipinnatisect.
Vegetative spread:
Longevity: Less than 1 year (Lawrence 1985).
Primary juvenile period: Less than 1 year (Lawrence 1985).
Flowers: Spring–summer. Probably native bee-pollinated, self-compatible (Lawrence 1985).

Fruit/seed: Achene 1.5–2.5 mm long, with pappus of hairs 5 mm long, mature January–April. Potential seed set/plant 3000–10 000; seed weight without pappus 1.2 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 90% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT **CT** ST NWS CWS NWP SWP; Qld, Vic.
Distribution Sydney area: Mainly Bathurst–Orange.
Select locations: Doonside, Capertee, Orange, Mandurama, Carcoar, Bowral.

Habitat

Habitat: Disturbed sites.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Clay and gravelly soil, basalt, fertile.
Exposure:

Conservation

Conservation: Not known.

Senecio hispidulus var. *hispidulus* ASTERACEAE

Hill Fireweed

Life history

Growth form: Erect herb, mostly 30–100 cm high, leaves more or less lanceolate or oblanceolate — margins finely to coarsely toothed or more or less pinnatifid.
Vegetative spread: No.
Longevity: Less than 1 year (Lawrence 1985).
Primary juvenile period: Less than 1 year (Lawrence 1985).
Flowers: At any time of year. Probably native bee-pollinated, self-compatible (Lawrence 1985).
Fruit/seed: Achene 1.5–2.7 mm long, with pappus of hairs 5 mm long, mature October–June. Potential seed set/plant 5000–10 000; seed weight wihout pappus 0.15 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Recruitment mainly after fire (D. Keith pers.comm.). Germination 95% (Lawrence 1985).
Fire response: Killed by fire (D. Keith pers.comm.). Flowers within 33 weeks of high-intensity fire (1/94) at Lane Cove (P. Kubiac pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC **CC** SC NT **CT** ST NWS SWS; Qld, Vic., Tas., W.A.
Distribution Sydney area: Coast and lower mountains.
Select locations: Putty, Avoca, Pymble, Rookwood, La Perouse, Otford, Shellharbour, Grose Vale, Nortons Basin, Thirlmere, Mt Tomah, Bowral.

Habitat

Habitat: Forest and coastal headlands, disturbed sites.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent.
Vegetation: Moist eucalypt forest, e.g. *Eucalyptus saligna*, to drier forest, e.g. *Eucalyptus piperita*, *E. eugenioides*.
Substrate: Sandy loams from shaded, sandstone, infertile.
Exposure: Sheltered sites, light–no shade.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Senecio jacobaea *

ASTERACEAE

Ragwort

Life history

Growth form: Rhizomatous herb, mostly 30–80 cm high.
Vegetative spread: Rhizomatous.
Longevity: Perennial or biennial.
Primary juvenile period:
Flowers: Autumn.
Fruit/seed: Achene 2 mm long, with pappus of hairs 5–6 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe and Asia.
Botanical subregions: CT ST; Vic., Tas., S.A., W.A.
Distribution Sydney area: Kangaloon.
Select locations: Kangaloon (1938) only Sydney record.

Habitat

Habitat: Cultivated land.
Altitude: 800 m **Annual rainfall:** 1500 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare, collected at Kangaloon and Goulburn, rare (Harden 1992). Weed of cultivation, unlikely to be a problem weed.

Senecio lautus subsp. *dissectifolius*

ASTERACEAE

Variable Groundsel

Life history

Growth form: Herb or small shrub.
Vegetative spread:
Longevity: Perennial (Lawrence 1985).
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: March–October. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 2 mm long with pappus of hairs 5 mm long, mature March–October. Potential seed set 5000–10 000; seed weight without pappus 0.23 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 80% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Mainly western Blue Mountains.
Select locations: Kincumber (1905), Tempe (1899), Jenolan Caves, South Megalong, Mt Werong, Mt Canobolas, Mt Jellore, Bowral.

Habitat

Habitat: Rocky outcrops, hillsides, creekbeds.
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Dry eucalypt forest and woodland.
Substrate: Rocky sites on granite, basalt, metamorphics.
Exposure:

Conservation

Conservation: Status unknown.

Senecio lautus **subsp.** ***lanceolatus*** **ASTERACEAE**

Variable Groundsel

Life history

Growth form: Herb or subshrub.
Vegetative spread:
Longevity: Perennial (Lawrence 1985).
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: March–July (limited data). Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 3 mm long, with pappus of hairs 5 mm long. Potential seed set/plant 10 000–20 000; seed weight without pappus 0.29 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 85% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT; Qld, Vic., W.A.
Distribution Sydney area:
Select locations: Maroubra (1893), Yerranderie, Kowmung River.

Habitat

Habitat: Ridgetops.
Altitude: 0–800 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Open-forest.
Substrate:
Exposure:

Conservation

Conservation: Not known.

Senecio lautus **subsp.** ***maritimus*** **ASTERACEAE**

Variable Groundsel

Life history

Growth form: Herb or small shrub.
Vegetative spread:
Longevity: Perennial (Lawrence 1985).
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: March–October. Probably native bee-pollinated; self-incompatible (Lawrence 1985).
Fruit/seed: Achene 3 mm long, with pappus of hairs 5 mm long, mature mostly July–December. Potential seed set/plant 2000–6000; seed weight without pappus 0.26 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 85% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Coastal, occasionally inland.
Select locations: Norah Head, Long Bay, Kurnell, Wattamolla, Five Islands, Geringong, Kiama, Glenorie, Yerranderie.

Habitat

Habitat: Coastal headlands and beaches.
Altitude: 0–200 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: With grasses and herbs, e.g. *Scaevola calandulacea*.
Substrate: Rocky sea coast, or sand dunes near the sea.
Exposure:

Conservation

Conservation: Status unknown.

Senecio linearifolius

ASTERACEAE

Life history

Growth form: Herb or shrub 50–150 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, at any time of year. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 2–2.5 mm long, with pappus of long hairs 5–8 mm long, mature October–June. Potential seed set/plant 10 000–20 000; seed weight without pappus 0.29 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed, possibly also water-dispersed. Possibly a coloniser species of disturbed sites. Germination 75% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS SWS; Vic., Tas.
Distribution Sydney area: Coast and Blue Mountains.
Select locations: Gosford, Hornsby, Northbridge, Ingleburn, Bulli, Culoul Range, Bilpin, Katoomba, Kanangra, Robertson, Wingello.

Habitat

Habitat: Moist forest, disturbed sites?
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Rainforest and moist eucalypt forest, e.g. with *Eucalyptus saligna, E. deanei, E. fastigata, E. radiata, E. dalrympleana.*
Substrate: Clay soils from basalt, shale, occasionally sandstone gullies, fertile–very fertile.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), Conservation status elsewhere unknown.

Senecio macranthus

ASTERACEAE

Life history

Growth form: Erect herb mostly 50–100 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, August–November. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 4–5 mm long, with pappus 8–10 mm long, mature September–November. Potential seed set/plant 1000–3000; seed weight without pappus 2.4 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 65% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT CT NWS CWS.
Distribution Sydney area: Western parts of Blue Mountains.
Select locations: Yerranderie, Mt Colong, Mt Werong, Killiecrankie Pass, Jenolan Caves, Winburndale, Upper Turon.

Habitat

Habitat: Moist gullies and hillsides.
Altitude: 500–1000 m **Annual rainfall:** above 900 mm

Typical local abundance: Frequent.
Vegetation: Eucalypt forest, e.g. with *Eucalyptus rossii, E. dives, Ficus rubiginosa, Acacia falciformis*, also rainforest gullies.
Substrate: Rocky hillsides on soils from shale and basalt, fertile, well-drained.
Exposure:

Conservation

Conservation: Not known.

Senecio madagascariensis * ASTERACEAE

Fireweed

Life history

Growth form: Herb, 20–60 cm high. Taproot shallow, branching, with numerous fibrous roots within 20 cm of soil surface (Parsons & Cuthbertson 1992).
Vegetative spread: Limited vegetative spread, stems may take root at nodes when in contact with moist soil.
Longevity: 1–2 years. Most plants are winter annuals, top growth dying off during summer and regrowing in autumn but in some situations can perennate (Sindel 1989).
Primary juvenile period: 6–10 weeks (Parsons & Cuthbertson 1992), 20 weeks (P. Kubiak pers. comm.).
Flowers: Yellow, June–October,
Fruit/seed: Achene 2 mm long, with pappus of fine silky white feathery hairs, 6 mm long, mature June–November. Each flower produces 100–150 seeds and one plant may produce 25,000–30,000 seeds (Watson et al. 1984). Growth rate quick.
Dispersal, establishment & growth: Diaspore: fruit. Mainly wind dispersed, close to parent plant (Parsons & Cuthbertson 1992), spread in hay and grain products, on clothing and vehicles and by livestock, birds and other animals (Watson et al. 1983). Soil-stored seedbank (Parsons & Cuthbertson 1992). Non-dormant fraction more than 90 %, stimulated by moisture. Optimum germination occurs between 15°–27° C. At 20° C, 50 % of seed germinated in light while only 8 % germination in the dark; germination can take place over much of the year but most germination is from March–June and plants can produce flowers 6–10 weeks after emergence (Watson et al. 1984). Young seedlings are more sensitive to frost than older plants (Sindel & Michael 1980).
Fire response: Killed; flowering within 15 weeks and fruiting within 20 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.). Spreads into bushland following fire (R. Buchanan pers. comm.). Not clear whether recruitment is from pre- or post-fire seed dispersal.
Interaction with other organisms: Toxic to livestock (cattle and horses) if eaten (Sindel & Michael 1992), but palatable to sheep and goats (Watson et al. 1984). Host to beetle *Chalcolampra* sp., Magpie Moth *Nyctemera amica*, Blue Stem Borer *Patagoniodes farinaria*, leaf and stem mining flies, and two species of flower head feeding flies (Tanner 1993).

Distribution

Status/origin: Naturalised exotic, native to S Africa and Madagascar. First recorded in the Hunter Valley 1918 (Parsons & Cuthbertson 1992).
Botanical subregions: NC CC SC NT CT CWS SWS; Qld.
Distribution Sydney area: Gosford, northern Sydney, Cumberland Plain, Western Sydney & Orange area.
Select locations: Wyong Creek (1954), Pennant Hills, Kurmond, Kellyville, Windsor (M. Clarke pers. comm.), Casula (1967), Campbelltown, Molong, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Heavily grazed pastures, cultivated land, roadsides and wasteland
Altitude: 0–1100 m **Annual rainfall:** above 600 mm
Typical local abundance: Frequent–dominant.
Vegetation: Exotic pastures, weedy herbaceous vegetation. Ground stratum.
Substrate: Sandy to clay soil from shales and sandstones. Soil fertile. Watertable mostly low, moisture supply intermittent, fresh.
Exposure: Indifferent–sheltered sites; light–no shade.

Conservation

Conservation: Spread in Sydney area mainly since 1960s. Not generally found in bushland areas but an agricultural weed in heavily grazed or neglected pastures and on cultivated or disturbed ground during autumn–spring (Watson et al. 1984). Best control is to encourage competing pasture species. Declared noxious weed in some shires in NSW. Spreads into bushland following fire (R. Buchanan pers. comm.).

Senecio minimus ASTERACEAE

Life history

Growth form: Erect herb, 20–100 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: October–March.
Fruit/seed: Achene 2 mm long, with pappus 4–5 mm long.
Dispersal, establishment & growth: Diaspore: fruit. Wind dispersed (Westoby et al. 1990). Probably quick growing coloniser species.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC SC CC NT CT ST; Qld, Vic, Tas., S.A., W.A., N.Z.
Distribution Sydney area: Mainly coastal, widespread.
Select locations: Mooney Mooney, Dural, Lane Cove, Otford, Mt Kembla, Bilpin, Ingleburn, Douglas Park, Razorback, Thirlmere Lakes, Mittagong.

Habitat

Habitat: Moist places, gullies, roadsides.
Altitude: 0–700 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt forest, e.g. with *Eucalyptus pilularis*, *Syncarpia glomulifera* and margin of rainforest, also riverbanks, e.g. with *Viminaria juncea*, *Phragmites australis*.
Substrate: Clay loam from shale to organic soils, fertile. Watertable high to low, periodically waterlogged.
Exposure: Shaded sites.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Senecio pterophorus * ASTERACEAE

Life history

Growth form: Erect shrub mostly 80–150 cm high.
Vegetative spread:
Longevity: Perennial (Lawrence 1985).
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, January–March. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 2 mm long, with pappus of hairs 5 mm long. Potential seed set/plant 20 000–30 000; seed weight without pappus 0.17 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 80% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to S Africa. Recently reported as a naturalised.
Botanical subregions: CC; Vic., S.A.
Distribution Sydney area: Western Sydney — a recently reported weed.
Select locations: Doonside (1989), Mt Druitt (1990), Kurmond (1990).

Habitat

Habitat: Remnant bush.
Altitude: 0–200 m **Annual rainfall:** 700–900 mm
Typical local abundance: Frequent.
Vegetation: Remnant bush, e.g. *Eucalyptus tereticornis–E. crebra* woodland. Mid-stratum.
Substrate: Clay soil from Wianamatta Shale, fertile. Watertable mostly low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Only recently reported as a naturalised species but its occurrence in remnant bushland areas in western Sydney suggests that it may be a potential bushland weed species.

Senecio quadridentatus ASTERACEAE

Cotton Fireweed

Life history

Growth form: Herb to about 40–100 cm high.
Vegetative spread: No.
Longevity: Annual or biennial (Purdie 1977).
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: October–March. Probably native bee-pollinated, self-compatible (Lawrence 1985).
Fruit/seed: Achene 3–4 mm long with pappus of hairs 5–7 mm long, mature October–March. Potential seed set/plant 15 000–30 000; seed weight without pappus 0.15 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Recruitment fire-related (Harden 1992). Germination 95% (Lawrence 1985).
Fire response: Seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT ST CWS SWS NWP; Vic.
Distribution Sydney area: Western Sydney, Bathurst.
Select locations: Denistone, Marayong, Glenfield, Grose Vale, Razorback, Thirlmere, Linden, Medlow Bath, Capertee, Bathurst, Wildes Meadow (P. Kodela pers. comm.).

Habitat

Habitat: Ephemeral watercourses, roadsides, disturbed sites.
Altitude: 0–1000 m **Annual rainfall:** 700–1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt woodland, e.g. with *Eucalyptus moluccana, E. polyanthemos, E. macrorhyncha*.
Substrate: Generally clay soils from Wianamatta Shale, also granite and limestone, fertile soil. Watertable mostly low.
Exposure: Light shade–full sun.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), status elsewhere unknown.

Senecio species *E* ASTERACEAE

Life history

Growth form: Erect herb 20–80 cm high. (Reported as annual at Culoul Range in 1981.)
Vegetative spread:
Longevity: Probably relatively short-lived.
Primary juvenile period:
Flowers: September–March.
Fruit/seed: Achene 3–4 mm long, with pappus 6–7 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:

Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT ST CWS SWS; Vic., Tas., W.A.
Distribution Sydney area: Mainly upper Blue Mountains but widespread.
Select locations: Culoul Range, Tuggerah, Bobbin Head, Kentlyn, Thirlmere Lakes, Medlow Bath, Wolgan Valley, Sunny Corner, Moss Vale.

Habitat

Habitat: Eucalypt woodland, possibly disturbed sites.
Altitude: 0–1200 mm **Annual rainfall:** above 900 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt forest, e.g. with *Eucalyptus punctata, E. beyeriana, Syncarpia glomulifera* and woodland, e.g. with *Eucalyptus mannifera.*
Substrate: Sandy loam, e.g. from shale enriched sandstone, well-drained–poorly drained, infertile.
Exposure:

Conservation

Conservation: Rare in coastal areas, conservation status unknown.

Senecio tamioides * ASTERACEAE

Life history

Growth form: Scrambling herb.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, winter.
Fruit/seed: Achene 2 mm long, with pappus 6–7 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to S Africa. Introduced as ornamental, occasionally naturalised.
Botanical subregions: CC; Qld.
Distribution Sydney area: Northern Sydney suburbs.
Select locations: Narrabeen (1917), Pennant Hills (1921).

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Occasionally naturalised in moist gullies in Sydney area.

Senecio tenuiflorus ASTERACEAE

Life history

Growth form: Herb, usually 30–80 cm high.
Vegetative spread: No.
Longevity: Less than 2 years.
Primary juvenile period:
Flowers: Spring–summer.
Fruit/seed: Achene 2.5 mm long, with pappus 6–8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CT; Qld, Vic., Tas., S.A.
Distribution Sydney area: Western Blue Mountains.
Select locations: Blackheath (1899), Jenolan Caves (1899), Gibraltar Rocks Trail.

Habitat

Habitat: Dispersed sites, open woodland.
Altitude: 800–1000 m **Annual rainfall:** 900–1200 mm
Typical local abundance: Occasional.
Vegetation: Woodland, e.g. *Eucalyptus sieberi–E. blaxlandii* (Keith & Benson 1988).
Substrate: Well-drained sandy soil on sandstones of shoalhaven group.
Exposure:

Conservation

Conservation: Localised and probably uncommon, conservation status unknown.

Senecio vagus subsp. *eglandulosus* ASTERACEAE

Life history

Growth form: Herb or shrub 60–120 cm high.
Vegetative spread:
Longevity: ? 2-4 years.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, October–January. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 5 mm long, with pappus 7–10 mm long, mature October–January. Potential seed set/plant 1000–2000; seed weight without pappus 1.92 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 45% (Lawrence 1985).
Fire response: Killed, seedlings grow vigorously after fire.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT CT; Qld.
Distribution Sydney area: Coast, and Blue Mountains.
Select locations: Avoca, Narrabeen, Ingleburn, Stanwell Park, Wallacia, Bargo, Blackheath, Jamieson Valley.

Habitat

Habitat: Moist gullies, creekbanks, headlands.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Chiefly rainforest or eucalypt forest, high rainfall.
Substrate: Med-high nutrient soils, from sandstone or alluvium.
Exposure: Mid-shade.

Conservation

Conservation: Bargo is southern limit. Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Senecio velleioides

ASTERACEAE

Life history

Growth form: Herb or shrub 30–130 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period: Probably less than 1 year (Lawrence 1985).
Flowers: Yellow, October–May. Probably native bee-pollinated, self-incompatible (Lawrence 1985).
Fruit/seed: Achene 2.5 mm long, with pappus 5–8 mm long. Potential seed set/plant 2000–5000; seed weight without pappus 0.54 mg (Lawrence 1985).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed. Germination 35% (Lawrence 1985).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST CWS; Vic., Tas.
Distribution Sydney area: Mainly Blue Mountains and Southern Highlands.
Select locations: Ourimbah SF, Thirlmere Lakes, Bargo, Macquarie Pass, Mt Kerry, Mt Cameron, Mt Victoria, Kangaloon, Fitzroy Falls, Wingello.

Habitat

Habitat: Moist Eucalypt forest.
Altitude: 0–1100 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Eucalypt forest, e.g. with *Eucalyptus gummifera* or more moist forest, e.g. with *Eucalyptus smithii*, *E. quadrangulata* (Fallding & Benson 1985).
Substrate: Sandy soils from sandstone, occasionally on basalt.
Exposure:

Conservation

Conservation: Status unknown.

Senecio vulgaris *

ASTERACEAE

Groundsel

Life history

Growth form: Erect herb 10–50 cm high.
Vegetative spread:
Longevity: Annual or overwintering (Ciba-Geigy 1968–).
Primary juvenile period:
Flowers: Pale yellow, throughout the year, usually self-pollinated, rarely insect-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 2 mm long, with pappus 5–7 mm long.
Dispersal, establishment & growth: Dispersed by wind, water, animals and humans; germinates throughout the year, often 2 or more generations in one year (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC CT ST; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area:
Select locations: Specimens unavailable.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:
Substrate: Soils rich in nutrients, nitrogen indicator (Ciba-Geigy 1968–).
Exposure: Disappears in closed stands for want of light (Ciba-Geigy 1968–).

Conservation

Conservation:

Sigesbeckia orientalis subsp. *orientalis* ASTERACEAE

Indian Weed

Life history

Growth form: Erect herb to 80 cm high.
Vegetative spread: No.
Longevity: Short-lived.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, January–May, peak March–April, flowerheads surrounded by sticky, glandular bracts.
Fruit/seed: Achene 2–3 mm long; mature March–June.
Dispersal, establishment & growth: Diaspore: fruit, no special seed dispersal morphology (Westoby et al. 1990), but fruit-head possibly dispersed by attachment as well as individual achenes dispersed by attachment (L.McD.). Coloniser of disturbed sites.
Fire response: Killed, germinates vigorously from soil-stored seed immediately after fire, even in absence of rain. Grew to 30 cm high and flowered in 4 months at Culoul Range in 1980 drought after fire. Killed by high-intensity fire (1/1994) at Lane Cove, seedlings flowered within 11 weeks, fruiting within 16 weeks (P. Kubiak pers. comm.).
Interaction with other organisms: Seeds eaten by White-browed Scrubwren *Sericornis frontalis* (Barker & Vestjens 1989,1990). Contains a saponin, used medicinally in Asia and Polynesia (Cambie & Ash 1994).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWP SWP; Qld, Vic., Tas., N.T., S.A., W.A., Asia, Africa.
Distribution Sydney area: Widespread.
Select locations: Watagan Mountains, Hornsby, Waterfall, Albion Park, Bomaderry, Grose Vale, Springwood, Goodmans Ford, Mount Wilson, Robertson.

Habitat

Habitat: Deep valleys, creeks, roadsides.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Margins of rainforest; open areas in tall forest, e.g. with *Eucalyptus pilularis, E. paniculata*, woodland, e.g. with *Angophora floribunda*.
Substrate: Fertile soils, from limestones, slate, volcanic necks, or sandy alluvium, often disturbed sites, one record indicates 'weed of cultivation'. Basalt (P. Kodela pers. comm.).
Exposure: Mid-shade.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Silybum marianum * ASTERACEAE

Variegated Thistle

Life history

Growth form: Herb to 2.5 m high.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period:
Flowers: Purple, September–December.
Fruit/seed: Achene 6–8 mm long, with pappus of bristles 15–20 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms: Poisonous to stock. Seed eaten by Galah *Cacatua roseicapilla* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to S Europe & N. Africa.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.

Select locations: Warwick Farm, Liverpool (1909), Doonside, Mt Annan, Berry, Mt Cameron, Orange, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Stockyards, paddocks, pastures.
Altitude: 0–1000 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Occasional.
Vegetation: Cultivated paddocks. Grazed pastures (P. Kodela pers. comm.).
Substrate: Clay soils from Wianamatta Shale, basalt, fertile, well drained. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Widespread weed.

Solenogyne bellioides (Lagenifera bellioides) ASTERACEAE

Life history

Growth form: Herb 5–18 cm high, with radical leaves and fleshy roots; rhizome short, vertical.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White-bluish, spring–summer.
Fruit/seed: Achene 2 mm long, no pappus. Mature October–May, peak April.
Dispersal, establishment & growth: Diaspore: fruit. Springs up after summer rain (Blakely, Herbarium note).
Fire response: Probably resprouts at ground level or below.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT NWS CWS SWP; Qld.
Distribution Sydney area: Widespread — lower elevations.
Select locations: Mt Wareng, Cheltenham, Concord, Blackett, Ingleburn, Menangle, Thirlmere, Glenmire, Butlers Swamp (P. Kodela pers. comm.), Goodmans Ford.

Habitat

Habitat: Low growing grassy sites, often subject to some disturbance.
Altitude: 0–700 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Low-growing grassland, e.g. burnt, compacted soil, between bricks in footpath. Sedgeland (P. Kodela pers. comm.). Understorey in woodland.
Substrate: Clay soils from Wianamatta Shale, also granite. Soil fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Indifferent to exposure, light shade–full sun.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Solenogyne dominii (Lagenifera sp. B) ASTERACEAE

Life history

Growth form: Herb 1.5–10 cm high; rhizome short, vertical, roots fleshy.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: Magenta-tinged.
Fruit/seed: Achene 2 long, no pappus, mature October–May, peak March.
Dispersal, establishment & growth: Diaspore: fruit.

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT CT ST CWS SWS; Vic.
Distribution Sydney area: Coast and western Blue Mountains.
Select locations: Hurstville (1899), Ryde, Albion Park, Goodmans Ford, Turondale, Glanmire.

Habitat

Habitat:
Altitude: 0–700 m **Annual rainfall:** 600–1200 mm
Typical local abundance: Frequent.
Vegetation: Woodland, e.g. with *Eucalyptus melliodora, E. albens*. Ground stratum.
Substrate: Granite, slate. Fertile–infertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Conservation status unknown.

Solenogyne gunnii (Lagenifera sp. A var. B) ASTERACEAE

Life history

Growth form: Herb to 11 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Magenta-tinged, November–March.
Fruit/seed: Achene 2–3 mm long, no pappus, mature January–May.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas.
Distribution Sydney area: Western Blue Mountains, Southern Highlands.
Select locations: Lidsdale, Hartley, Orange, Oberon, Abercrombie Caves, Wingecarribee Swamp.

Habitat

Habitat: Grassland. Swamp margins.
Altitude: 500–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent–rare.
Vegetation: Grassland with *Brachycome, Plantago varia* etc. Ground stratum; sedgeland/pasture ecotone area (P. Kodela pers. comm.).
Substrate: Sandy loam or on metamorphic rock. Infertile soil or more fertile peaty soil (P. Kodela pers. comm.). Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Full sun.

Conservation

Conservation:

Solidago canadensis var. *scabra* * ASTERACEAE

Goldenrod

Life history

Growth form: Herb 0.8–2 m high with stolons and rhizomes.
Vegetative spread: Spreads by stolons up to several metres.
Longevity: Indefinite.

Primary juvenile period:
Flowers: Yellow, summer.
Fruit/seed: Achene 1–2 mm long, with pappus of bristles 2–3 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed, though establishment mainly result of human dispersal of stolons, e.g. dumping garden waste.
Fire response: Resprouted from base, flowering within 16 weeks and fruiting within 19 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to N America; introduced for horticulture, localised garden escape.
Botanical subregions: NC CC NT CWS; Qld, S.A.
Distribution Sydney area: Suburban areas.
Select locations: Wyong (1961), Roseville, Maroota, Blacktown, Casula, Minto, Campbelltown.

Habitat

Habitat: Roadsides and disturbed sites near habitation.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Disturbed sites.
Substrate: Disturbed sites on sandstone, shale. Soil fertile–infertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Full sun.

Conservation

Conservation: Localised garden escape, spreads vegetatively in limited areas.

Soliva anthemifolia * ASTERACEAE

Dwarf Jo-jo, Button Weed

Life history

Growth form: Small, diffuse, prostrate, stemless herb with radical leaves.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: June–March, peak November.
Fruit/seed: Achene 3 mm long, with 2–3 mm spine.
Dispersal, establishment & growth: Diaspore: fruit, burr, animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NWS NWP SWP; Qld, Vic., S.A.
Distribution Sydney area: Mainly suburban areas.
Select locations: Sydney (1805), Cheltenham, Penshurst, Glenfield, Richmond, Camden, Albion Park.

Habitat

Habitat: Weed of lawns and playing fields.
Altitude: 0–200 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grasslands, crops, pastures, lawns.
Substrate: Sandy and clay soils.
Exposure:

Conservation

Conservation: Weed of lawns and playing fields.

Soliva sessilis * (Soliva pterosperma) ASTERACEAE

Jo-jo, Bindyi, Lawn Burweed

Life history

Growth form: Small, diffuse, prostrate, stemless herb; leaves radical, branches stolon-like.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Pale greenish-yellow, August–December.
Fruit/seed: Achene 3–4 mm long, with wings and spine 3 mm long, forming a burr. Mature August–December.
Dispersal, establishment & growth: Diaspore: burr, animal-dispersed, including human feet. Seed germinates in winter, plant dies in summer unless irrigated (Commens et al. 1982).
Fire response:
Interaction with other organisms: May cause dermatitis of knees, soles of feet, and arms in humans (Commens et al. 1982).

Distribution

Status/origin: Naturalised exotic, native to S America. First identified on the hill of Sydney Cricket Ground in 1890s (Commens et al. 1982).
Botanical subregions: NC CC SC ST NWS CWS SWS Vic.
Distribution Sydney area: Mainly coastal areas.
Select locations: Woy Woy, Pennant Hills, Moore Park (1899), Cabarita, Glenfield, Dural, Windsor, Albion Park, Kangaroo Valley.

Habitat

Habitat: Weed of lawns, disturbed sites.
Altitude: 0–200 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Lawns.
Substrate: Sandy soils, infertile, well-drained.
Exposure: Full sun.

Conservation

Conservation: Nuisance weed of lawns.

Sonchus asper subsp. ***glaucescens*** * ASTERACEAE

Prickly Sowthistle

Life history

Growth form: Herb, 20–150 cm high, with woody taproot.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: Less than 2 years.
Flowers: Yellow, October–December. Insect-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 2–3 mm long, with pappus 8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, dispersed by wind, water, animals and humans; moderate to vigorous competitor for space and nutrients (Ciba-Geigy 1968–).
Fire response: Seedlings recorded less than 1 year after fire (Purdie 1977).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST CWS SWS SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Colo (1911), Woy Woy (1912), Liverpool, Richmond, Mt Annan, Mt Tomah, Blackheath, Hartley, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Weed of roadsides, cultivation, gardens and wasteland.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Wasteland weeds.
Substrate: Clay soils from shale and basalt, fertile.

Exposure: Full sun.

Conservation

Conservation: Weed of disturbed sites, not invasive of bush.

Sonchus hydrophilus ASTERACEAE

Native Sowthistle

Life history

Growth form: Herb 50–120 cm high, with woody taproot.
Vegetative spread: No.
Longevity: 1–3 years.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, at any time, probably insect-pollinated.
Fruit/seed: Achene 4 mm long, with pappus 8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC; Qld, S.A., N.G.
Distribution Sydney area: Coast south from Sydney.
Select locations: Cronulla (1816), Gerringong (1928).

Habitat

Habitat: Sea shore cliffs and rocky headlands.
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate: Temporarily wet ground.
Exposure:

Conservation

Conservation: Uncommon.

Sonchus oleraceus * ASTERACEAE

Common Sowthistle

Life history

Growth form: Herb 30–110 cm high with taproot and fibrous roots.
Vegetative spread: No
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, most of the year. Insect-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 3–4 cm long, with pappus 5–8 mm long, mature March–November.
Dispersal, establishment & growth: Diaspore: fruit; animal, water, and wind-dispersed (Carr et al. 1992).
Fire response: Killed after medium to high-intensity fire, flowering and fruiting within 15 weeks of high-intensity fire (1/1994) at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms: Foodplant of Grey Teal *Anas gibberifrons* (Barker & Vestjens 1989,1990). Eaten by rabbits (R. Buchanan pers. comm.). Used as green feed for caged birds.

Distribution

Status/origin: Naturalised exotic, native to Europe. Formerly used in folk medicine and as a salad (Ciba-Geigy 1968–).
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Cheltenham, Dural, Balgowlah, Centennial Park (1901), Casula, Liverpool, Hilltop, Minnamurra, Robertson (P. Kodela pers. comm.), Cambewarra.

Habitat

Habitat: Wetlands, gardens, mechanically disturbed places, roadsides.
Altitude: 0–800 m **Annual rainfall:** above 700 m
Typical local abundance: Occasional.
Vegetation: Disturbed woodland, wetlands.
Substrate: Clay soils from Wianamatta Shale or moist sandy alluvium, fertile. Recorded on saline sites in western NSW (Semple 1993). Soils rich in nitrogen (Ciba-Geigy 1968–).
Exposure: Light shade–full sun.

Conservation

Conservation: Widespread weed of cultivation, pastures and disturbed areas but not invasive of bushland except after fires. A minor invader of bushland after fire of any intensity, especially near edges (R. Buchanan pers. comm.).

Stemmacantha australis (Leuzea australis, Centaurea australis) ASTERACEAE

Life history

Growth form: Erect herb to 60 cm high, branches slightly woolly.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Purplish, spring–autumn.
Fruit/seed: Achene 8 mm long, with pappus 20 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ?NWP; Qld, Vic.
Distribution Sydney area: Jenolan Caves.
Select locations: Jenolan Caves (1899), only Sydney record.

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation:
Substrate: Heavy soils.
Exposure:

Conservation

Conservation: Probably very rare or extinct in Sydney area, conservation status unknown.

Stuartina muelleri ASTERACEAE

Spoon Cudweed

Life history

Growth form: Herb 2–12 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Greenish, spring.
Fruit/seed: Achene 0.5–1 mm long, no pappus.
Dispersal, establishment & growth: Diaspore: fruit.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST NWS CWS SWS NWP SWP NFWP; Vic., S.A., W.A.
Distribution Sydney area: Abercrombie Caves.

Select locations: Abercrombie Caves (1951).

Habitat

Habitat:
Altitude: 600 m **Annual rainfall:** 600 mm
Typical local abundance:
Vegetation: Grassland, woodland and sclerophyll forest.
Substrate: Rocky hillsides.
Exposure:

Conservation

Conservation: Widespread in inland districts. Eastern limit is Abercrombie Caves, conservation status unknown.

Tagetes minuta * ASTERACEAE

Stinking Roger

Life history

Growth form: Strongly aromatic herb 1–2 m high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, February–May.
Fruit/seed: Achene 5–8 mm long, with pappus of scales 3 mm long.
Dispersal, establishment & growth: Diaspore: fruit, probably animal-dispersed.
Fire response: Probably killed, flowering and fruiting within 20 weeks of high-intensity fire at Narrabeen (1/1994) (P. Kubiak pers. comm.). Dense stands along roadsides near Narrabeen Lakes and Ingleside after high-intensity fire (1/1994) (L.McD.), probably from soil-stored seed.
Interaction with other organisms: Contains a volatile oil with tagetone; reported to have an irritant effect on eyes and skin and cause contact dermatitis; taints dairy products if eaten by cows, and suspected of poisoning stock (Hurst 1942).

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC SC NT NWS CWS SWP NFWP; Qld, S.A., W.A.
Distribution Sydney area: Mainly coastal.
Select locations: Kincumber, Avalon, Hornsby, Forestville (L.McD.), Sydney (1893), Kurrajong, Doonside, Picton, Bulli, Wollongong, Kiama, Berry.

Habitat

Habitat: Roadsides, riverbanks.
Altitude: 0–100 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–dominant.
Vegetation: With weeds, e.g. *Bidens pilosa, Sida rhombifolia.*
Substrate: Alluvial and clay soils, fertile, watertable mostly low.
Exposure: Mid shade–full sun.

Conservation

Conservation: Weed of disturbed sites.

Tanacetum parthenium * ASTERACEAE

Feverfew

Life history

Growth form: Erect, aromatic herb to 60 cm high, with rhizome.
Vegetative spread: No.
Longevity: About 5 years.
Primary juvenile period: Less than 1 year.
Flowers: White, disc yellow, spring–summer.
Fruit/seed: Achene 1.5 mm long, with minute pappus.
Dispersal, establishment & growth: Diaspore: fruit, ligule persistent for long enough to aid wind-dispersal?

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe, introduced as garden ornamental, rarely naturalised.
Botanical subregions: CT ST CWS; Vic., Tas., S.A.
Distribution Sydney area:
Select locations: Campbelltown (1963).

Habitat

Habitat: Gardens, roadsides, wasteland.
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Clay soils.
Exposure:

Conservation

Conservation: Occasionally naturalised on roadsides and as a garden weed.

Tanacetum vulgare * ASTERACEAE

Tansy

Life history

Growth form: Erect, aromatic herb to 1.2 m high, with rhizome.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, spring–autumn.
Fruit/seed: Achene 1–2 mm long, with minute pappus.
Dispersal, establishment & growth: Diaspore: fruit. Ligule appears to be persistent for long enough to aid wind-dispersal.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, sporadic garden escape.
Botanical subregions: CC SC NT **CT** ST NWS NWP; Qld,Vic., Tas., S.A.
Distribution Sydney area: Coast, western Blue Mountains, Southern Highlands.
Select locations: Cheltenham, Leichhardt, Otford, Nowra, Mt Wilson (1896), Bowenfels, Bathurst, Bowral, Kangaloon (P. Kodela pers. comm.), Bundanoon.

Habitat

Habitat: Roadsides and vacant land.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassy areas.
Substrate: Clay soils.
Exposure: Full sun.

Conservation

Conservation: Naturalised along roadsides, probably not invasive of bush.

Taraxacum officinale * ASTERACEAE

Dandelion

Life history

Growth form: Herb 5–40 cm high, with radical leaves.
Vegetative spread: No.
Longevity: Perennial.
Primary juvenile period:
Flowers: Yellow, most of the year.
Fruit/seed: Achene 2.5–4.5 mm long, with pappus of bristles 6 mm long.

Dispersal, establishment & growth: Diaspore: fruit. Wind-dispersed many kilometres (Buchanan 1989).
Fire response: Probably resprouted, flowering within 11 weeks and fruiting within 25 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms: Palatable to rabbits (Leigh et al. 1987). Foodplant of moth caterpillars *Amata* sp., *Xanthorhoe vicissata* and *Spilosoma glatignyi* (Coupar & Coupar 1992). Medicinal properties — used in Europe and in Australia, late 1800s.

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST NWS SWS NWP SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Balgowlah, Ermington, Kurnell, Cabarita, Casula, Campbelltown, Mt Kembla (1891), Jenolan Caves (1886), Moss Vale.

Habitat

Habitat: Lawns, roadsides, wasteland and in cultivated and pasture areas.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Occasional.
Vegetation: Gardens, lawns.
Substrate: Clay soils, fill, moderate nutrients. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Light shade–full sun (R. Buchanan pers. comm.).

Conservation

Conservation: Minor weed. Rarely invades bushland (R. Buchanan pers. comm.).

Tolpis umbellata * ASTERACEAE

Yellow Hawkweed

Life history

Growth form: Herb to 40 cm high
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, rarely purple, November–March.
Fruit/seed: Achene 1–2 mm long, with hairs.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean region, America, S Africa.
Botanical subregions: CC NT CT ST NWS CWS SWS; Vic., S.A.
Distribution Sydney area: Western Sydney and Bathurst–Blayney.
Select locations: Mt Colah, Minto, Castle Hill, Richmond (1910), Marrangaroo, Glanmire, Blayney (1899).

Habitat

Habitat: Grassland, woodland.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassland, woodland.
Substrate: Heavy clay soils.
Exposure:

Conservation

Conservation: Occasionally naturalised, not invasive of bushland.

Tragopogon porrifolius * ASTERACEAE

Salsify

Life history

Growth form: Herb to 1.2 m high with long taproot.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period: 2 years.
Flowers: Pale–deep purple, October–Jan.
Fruit/seed: Achene 10–15 mm long, with plumose pappus, 15–25 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind and probably animal-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia. Introduced as root vegetable plant, occasionally naturalised.
Botanical subregions: CC NT CT ST NWS CWS SWS SWP NFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Western Sydney, Tablelands.
Select locations: Blacktown, Revesby, Emu Plains, Liverpool, Mt Annan, Menangle (1893), Orange, Miittagong, Moss Vale.

Habitat

Habitat: Roadsides, grassland and wasteland.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Wasteland weeds, e.g. *Echium*, *Papaver somniferum* and pasture grasses.
Substrate: Clay soils. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Occasionally naturalised in rural areas.

Tripleurospermum inodorum * (Matricaria perforata) ASTERACEAE

Scentless Mayweed

Life history

Growth form: Herb 15–100 cm high.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period: 2 years.
Flowers: White, disc yellow, spring–summer. Insect-pollinated (Ciba-Geigy 1968–).
Fruit/seed: Achene 2 mm long, with small pappus.
Dispersal, establishment & growth: Diaspore: fruits dispersed by wind, water, animals, and humans (with cereals and seed); moderate–vigorous competitor for space and user of nitrogen (Ciba-Geigy 1968–).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe and Asia. Distribution world-wide (Ciba-Geigy 1968–).
Botanical subregions: CC NT CWS; Tas.
Distribution Sydney area: Ryde.
Select locations: Ryde TAFE (1966) only Sydney record.

Habitat

Habitat: Roadsides, and waste places.
Altitude: 200 m **Annual rainfall:** 1000 mm
Typical local abundance: Occasional.
Vegetation:
Substrate: Nitrogenous soil (Ciba-Geigy 1968–).
Exposure:

Conservation

Conservation: Uncommon in Sydney area.

Triptilodiscus pygmaeus (Helipterum australe) ASTERACEAE

Life history

Growth form: Herb to 8 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, Sept–Nov.
Fruit/seed: Achene 2 mm long, with plumed pappus of 3–4 bristles.
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., S.A., W.A.
Distribution Sydney area: Mainly western Sydney and western Blue Mountains.
Select locations: Hornsby, Auburn, Newington, Leumeah, Vineyard, Richmond, Menangle Park, Hartley Vale, Winburndale, Abercrombie Caves.

Habitat

Habitat: Grasslands.
Altitude: 0–700 m **Annual rainfall:** 600–1200 mm
Typical local abundance: Occasional.
Vegetation: Grasslands and woodlands.
Substrate: Clay soils, sometimes bare areas, wet places, infertile soils.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991).

Vellereophyton dealbatum * (Gnaphalium candidissimum) ASTERACEAE

White Cudweed

Life history

Growth form: Herb to 50 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: 1 year.
Flowers: Yellow, October–December.
Fruit/seed: Achene 0.4 mm long, with pappus of bristles 1.5 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Africa.
Botanical subregions: CC; Vic., S.A., Tas.
Distribution Sydney area: Mainly Maroubra–La Perouse.
Select locations: Maroubra Bay (1959), Malabar, Little Bay, La Perouse, Rookwood Cemetery.

Habitat

Habitat: Disturbed moist sites.
Altitude: 0–100 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Margins of swamp.
Substrate: Wet sandy or clay soils, in depressions, disturbed sites.
Exposure:

Conservation

Conservation: Locally naturalised exotic, probably still spreading.

Verbesina encelioides subsp. *encelioides* * ASTERACEAE

Crownbeard

Life history

Growth form: Herb to 60 cm high, shallow-rooted.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, January–April.
Fruit/seed: Achene 5–8 mm long, with pappus of bristles 1–2 mm long (obscured by wings).
Dispersal, establishment & growth: Diaspore: fruit, probably wind-dispersed and/or water-dispersed. Seasonally and locally abundant.
Fire response:
Interaction with other organisms: Poisonous to stock if eaten.

Distribution

Status/origin: Naturalised exotic, native to America.
Botanical subregions: NC CC ST NWS CWS SWS NWP SWP NFWP; Qld, Vic., N.T., S.A.
Distribution Sydney area: Hawkesbury–Nepean Floodplain.
Select locations: Wisemans Ferry (1908), Ebenezer, Windsor, Richmond, Emu Plains.

Habitat

Habitat: Creeks, roadsides and disturbed habitats.
Altitude: 0–100 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Frequent.
Vegetation: Weeds in disturbed areas.
Substrate: Sandy riverbanks and rises, clay loams, fertile, watertable mostly low.
Exposure:

Conservation

Conservation: Minor weed.

Vernonia cinerea var. *cinera* ASTERACEAE

Life history

Growth form: Herb to 0.6 m high with tubular purple or white flowers and thick taproot.
Vegetative spread: No.
Longevity: 1–5 years.
Primary juvenile period:
Flowers: White or purple, October–May, peak April.
Fruit/seed: Achene 1–2 mm long, with pappus 4–5 mm long. Mature October–May.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed (Westoby et al. 1990). Seedling establishment possibly related to disturbance.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT NWP; Qld, N.T., Africa, Asia.
Distribution Sydney area: Widespread especially Cumberland Plain.
Select locations: Hornsby, Silverwater, Ingleburn, Doonside, Douglas Park, Bulli, Bomaderry, Culoul Range, Grose Vale, Kowmung River.

Habitat

Habitat: Along roadsides and in grassland.
Altitude: 0–500 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Grassy open-forest, e.g. with *Eucalyptus crebra, E. fibrosa, E. eugenioides, Syncarpia glomulifera.*
Substrate: Various — sandy riverbank, clay soil from basalt, shale. Soil very fertile–fertile–infertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Light shade.

Conservation

Conservation: Conserved in Western Sydney (Benson & McDougall 1991).

Vittadinia cervicularis var. *cervicularis* ASTERACEAE

Life history

Growth form: Herb.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–purple, October.
Fruit/seed: Achene 8.5–10 mm long, pappus of bristles 6–9 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT NWS NWP SWP SFWP; Vic., S.A., W.A.
Distribution Sydney area: Hill End.
Select locations: Hill End Bridle Track (1965) only record for area.

Habitat

Habitat: Woodland and cleared land.
Altitude: 600 m **Annual rainfall:** 900 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland.
Substrate: Rocky hillside.
Exposure:

Conservation

Conservation: Rare in Sydney area. Occurs mainly west of area, Hill End eastern limit; conservation status unknown.

Vittadinia cervicularis var. *subcervicularis* ASTERACEAE

Life history

Growth form: Herb.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–purple, September–October.
Fruit/seed: Achene 8.5–10 mm long, with pappus of bristles 6–9 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CWS NWP SWP SFWP; W.A.
Distribution Sydney area: Silverdale.
Select locations: Silverdale (1964) only Sydney record.

Habitat

Habitat: Pasture, grassland and woodland.
Altitude: 200 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Pasture and grassland.
Substrate:
Exposure:

Conservation

Conservation: Rare in the Sydney area, Silverdale only record.

Vittadinia cuneata var. *cuneata* forma *cuneata* (Vittadinia form b) ASTERACEAE

Fuzzweed

Life history

Growth form: Woody herb 10–40 cm high.
Vegetative spread:
Longevity: Annual or perennial.
Primary juvenile period:
Flowers: Pale blue–mauve, October–March.
Fruit/seed: Achene 4–7 mm long, with pappus of bristles 4–8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC NT ST NWS CWS SWS NWP SWP NFWP SFWP; Vic., Tas., S.A.
Distribution Sydney area: Western Sydney.
Select locations: Grose Vale, St Marys, Emu Plains, Cobbitty.

Habitat

Habitat:
Altitude: 0–200 m **Annual rainfall:** 700–1000 mm
Typical local abundance:
Vegetation: Eucalypt forest and woodland.
Substrate: Clay soil from Wianamatta Shale.
Exposure:

Conservation

Conservation: Rare in Western Sydney, conservation status unknown.

Vittadinia cuneata var. *cuneata* forma *minor* (Vittadinia form a) ASTERACEAE

Fuzzweed

Life history

Growth form: Woody herb 10–40 cm high.
Vegetative spread:
Longevity: Annual or perennial.
Primary juvenile period:
Flowers: Pale blue–mauve, most of year, September–May.
Fruit/seed: Achene 4–7 mm long, with pappus of bristles 4–8 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS SWS; Vic.
Distribution Sydney area: Widespread.
Select locations: Morisset, Barranjoey, Pennant Hills, Bringelly, Doonside, Silverdale, Burragorang Valley, Jenolan Crossing, Bowral.

Habitat

Habitat:
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Woodland, e.g. with *Eucalyptus fibrosa, E. melliodora, E. tereticornis* with grassy groundcover.
Substrate: Clay soil from shale and sandstone.
Exposure:

Conservation

Conservation: Status unknown.

Vittadinia dissecta var. *dissecta* ASTERACEAE

Life history

Growth form: Herb 10–35 cm high.
Vegetative spread:
Longevity: Annual or short-lived perennial.
Primary juvenile period:
Flowers: White–blue, most of the year.
Fruit/seed: Achene 5 mm long, with pappus of bristles 5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; Qld, Vic.
Distribution Sydney area: Sporadic, mainly coastal.
Select locations: Mt Kembla (1889), Kiama (1850), Penrith (1888).

Habitat

Habitat:
Altitude: 0–300 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Apparently rare, last collected 1889.

Vittadinia gracilis (Vittadinia sp. E) ASTERACEAE

Life history

Growth form: Small shrub 10–40 cm high, with woody base.
Vegetative spread:
Longevity: 1–5 years.
Primary juvenile period: Less than 1 year.
Flowers: Purple, September–December.
Fruit/seed: Achene 5–6 mm long, with pappus of bristles 5–7 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC CT ST CWS SWS NWP SWP SFWP; Vic., Tas., S.A.
Distribution Sydney area: Mainly Bathurst–Orange.
Select locations: Panania, Flemington Saleyards, Bathurst, Orange.

Habitat

Habitat: Roadsides, pastures.
Altitude: 0–1000 m **Annual rainfall:** 800–1200 mm
Typical local abundance: Frequent.
Vegetation:
Substrate: Clay soils from shale, fertile.
Exposure:

Conservation

Conservation: Few collections, status unknown.

Vittadinia hispidula var. *hispidula* ASTERACEAE

Life history

Growth form: Erect herb.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–purple, August.
Fruit/seed: Achene 3 mm long, with pappus of bristles 5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC CT NT; Qld.
Distribution Sydney area: North of Sydney
Select locations: Colo Heights (1958), Ku-ring-gai Chase (1916).

Habitat

Habitat:
Altitude: 0–300 m **Annual rainfall:** above 900 mm
Typical local abundance: Rare.
Vegetation: Eucalypt forest.
Substrate: Gravelly clay.
Exposure:

Conservation

Conservation: Apparently rare, Ku-ring-gai Chase is southern limit, conservation status unknown.

Vittadinia hispidula var. *setosa* (Vittadinia hispidula) ASTERACEAE

Life history

Growth form: Erect herb.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–purple, July.
Fruit/seed: Achene 3 mm long, with pappus of bristles 5 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; Qld.
Distribution Sydney area:
Select locations: Como (1896) only Sydney record.

Habitat

Habitat: Roadsides and beach areas.
Altitude: 0–100 m **Annual rainfall:** above 1100 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Apparently rare, conservation status unknown.

Vittadinia muelleri (Vittadinia sp. G) ASTERACEAE

Life history

Growth form: Herb with woody rootstock and tufted stems.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Bluish-purple, September–May.
Fruit/seed: Achene 5 mm long, with pappus of bristles 7 mm long, mature September–May.
Dispersal, establishment & growth: Diaspore: fruit, no strong after-ripening requirement, wind-dispersed. Germination promoted by light. Germination promoted by high temperature and cold-stratification, optimum germination regime 25°/15°C. (Willis & Groves 1991).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC NT CT ST NWS CWS SWS; Qld, Vic., Tas.
Distribution Sydney area: Western Sydney and Southern Highlands.
Select locations: Windsor, St Marys, Bringelly, The Oaks, Narellan, Berrima (1889), Woodhouselee.

Habitat

Habitat: Grassland.
Altitude: 0–700 m **Annual rainfall:** 600–900 mm
Typical local abundance: Rare.
Vegetation: Grassland. Ground stratum.
Substrate: Wianamatta Shale. Fertile soil. Watertable permanently low, moisture supply intermittent, fresh.
Exposure: Full sun.

Conservation

Conservation: Probably now rare. Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status unknown.

Vittadinia pustulata (Vittadinia sp. H) ASTERACEAE

Life history

Growth form: Herb or small shrub 10–30 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: September–March.
Fruit/seed: Achene 3–4 mm long, with pappus of bristles 5–7 mm long.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC CWS NWP; Qld, N.T., S.A., W.A.
Distribution Sydney area: Western Sydney.
Select locations: Blacktown, Castlereagh, Penrith, Regentville, Silverdale, Ingleburn, Camden.

Habitat

Habitat: Disturbed sites, roadsides.
Altitude: 0–300 m **Annual rainfall:** 700–900 mm
Typical local abundance:
Vegetation: Grassland, Cumberland Plain Woodland, e.g. with *Eucalyptus moluccana*, *E. tereticornis*.
Substrate: Clay soils from Wianamatta Shale, fertile.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991), conservation status elsewhere unknown.

Vittadinia sulcata (Vittadinia sp. F) ASTERACEAE

Life history

Growth form: Herb 10–30 cm high.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period: Less than 1 year.
Flowers: Purple, August–October.
Fruit/seed: Achene 5–8 mm long, with pappus of bristles 6–8 mm long, matures March–April, August.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NWS SWS NWP SWP NFWP; all mainland States.
Distribution Sydney area: South-western Sydney.
Select locations: Como, Minto, Regentville, Razorback, Douglas Park, Goodmans Ford.

Habitat

Habitat: Open grassy areas.
Altitude: 0–200 m **Annual rainfall:** 700–1000 mm
Typical local abundance: Occasional.
Vegetation: Grassland or grassy woodland, e.g. with *Eucalyptus albens, E. melliodora, Angophora floribunda.*
Substrate: Dry sites, probably clay soils.
Exposure:

Conservation

Conservation: Conservation status unknown.

Vittadinia tenuissima ASTERACEAE

Western New Holland Daisy

Life history

Growth form: Slender herb to more than 40 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Spring.
Fruit/seed: Achene 3–4 mm long, with pappus of bristles 5 mm long, mature March.
Dispersal, establishment & growth: Diaspore: fruit, wind-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CWS; Qld, Vic.
Distribution Sydney area:
Select locations: Wollemi NP (1982), Grose Vale (1910), Grose Vale (1910), Kiama (1850).

Habitat

Habitat: Disturbed sites.
Altitude: 0–400 m **Annual rainfall:** above 900 mm
Typical local abundance:
Vegetation:
Substrate: Fertile soils, basalt intrusions (Wollemi).
Exposure:

Conservation

Conservation: Apparently rare, conservation status unknown.

Xanthium cavanillesii * ASTERACEAE

South American Burr

Life history

Growth form: Monoecious herb to 1 m high with scabrous stems.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Summer–autumn.
Fruit/seed: Burr 15–30 mm long with spines, achenes retained inside, mature December–May.
Dispersal, establishment & growth: Diaspore: burr, animal-dispersed, also spread in floodwaters and along watercourses.
Fire response:
Interaction with other organisms: Hybridises with *Xanthium occidentale.*

Distribution

Status/origin: Naturalised exotic, native of America.
Botanical subregions: CC CWS;
Distribution Sydney area: Banks of Hawkesbury River.
Select locations: Wisemans Ferry, Ebenezer, Windsor (1915), Richmond, Castlereagh.

Habitat

Habitat: Riverbanks.
Altitude: 0–100 m **Annual rainfall:** 800–900 mm
Typical local abundance:
Vegetation:
Substrate: Sandy loam.
Exposure:

Conservation

Conservation: Naturalised along Hawkesbury-Nepean but has not shown the same ability to spread as other *Xanthium* species (Milvain 1983).

Xanthium occidentale * (Xanthium chinese, X. pungens) ASTERACEAE

Noogoora Burr, Cockle Burr

Life history

Growth form: Herb to 2 m high with stout taproot, stems hairy and purplish.
Vegetative spread: No.
Longevity: 6–9 months.
Primary juvenile period: Less than 1 year.
Flowers: Inconspicuous, flowering determined by day length, late February–April (Milvain 1983).
Fruit/seed: Hard, woody burr 16–18 mm long, with hooked spines. Each burr with 2 different sized seeds, upper and lower, retained inside. No pappus on achenes. Mature April–June.
Dispersal, establishment & growth: Diaspore: burr; animal-dispersed, also water-dispersed, float and spread in floodwater and along watercourses. Non-dormant seed will germinate in 2 days, dormant seed may germinate after 3 weeks (Langkamp 1987). Upper seed exhibits innate dormancy, overcome by high temperature and exposure to light; induced dormancy in the lower seed following soil-storage during summer, overcome by storage in soil over winter or by high temperature and exposure to light. Seeds germinate in late spring following favourable weather or along waterways following a rise and fall of water levels when temperatures are high (Milvain 1993). Summer-growing. Plants die off in autumn but burrs remain on the dead plant until next season.

Fire response: Killed by high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms: Toxic to stock if eaten. 3 insects and a fungus have been released since 1932 for control but have been unsuccessful (Milvain 1983). Attacked by gall-forming moth *Epiblema strenuana* recently introduced from Mexico (Common 1990).

Distribution

Status/origin: Naturalised exotic, native to N America. Introduced into Australia with cotton seed from the Mississippi delta and first discovered in Australia in late 1860s at Noogoora Station near Ipswich Qld (Milvain 1983).
Botanical subregions: NC CC NT NWS CWS SWS NWP SWP NFWP SFWP; all mainland States.
Distribution Sydney area: Hawkesbury–Nepean floodplain, Georges River, Cooks River.
Select locations: Pennant Hills, Westmead, Cooks River (1911), Ermington, Casula, Colo River, Richmond, Castlereagh, Cabramatta, Cobbitty, Royal NP.

Habitat

Habitat: Riverbanks, creeks.
Altitude: 0–100 m **Annual rainfall:** 700–1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Ground stratum, with riverbank weed species.
Substrate: Sandy loam, fertile. Watertable mostly high, moisture supply intermittent.
Exposure: Sheltered, light shade–full sun.

Conservation

Conservation: Widespread along rivers and creeks and flats after late spring or summer flooding. Declared noxious weed in all States.

Xanthium spinosum * ASTERACEAE

Bathurst Burr

Life history

Growth form: Monoecious herb to 1 m high with taproot, stems pubescent, armed with 3-pronged spines at base of leaves.
Vegetative spread: No.
Longevity: 1–6 months.
Primary juvenile period: 1–4 months.
Flowers: January–March.
Fruit/seed: Burr 10–12 mm long with hooked spines, each with 2 brown seeds, a smaller soft seed that germinates in the first season and a larger, harder seed that does not germinate until the 2nd or 3rd year or later (Milvain 1991). Burr contains an upper and a lower seed (Langkamp 1987). Adheres to hair of stock or wool of sheep causing considerable annoyance (Herbarium note).
Dispersal, establishment & growth: Diaspore: burr, dispersed by animals, humans and water (Ciba-Geigy 1968–). Non-dormant seed will germinate in 2 days, dormant seed may germinate after 3 weeks; this species exhibits enforced dormancy, the burr may restrict gas exchange (Langkamp 1987). Germinates in spring–summer following rain, flowers January–March. Later-establishing plants flower and seed within a few weeks.
Fire response:
Interaction with other organisms: Attacked by gall-forming moth *Epiblema strenuana* recently introduced from Mexico (Common 1990). Plant believed to be toxic at early stages until development of roots (Milvain 1991). A mycoherbicide *Colletotrichum orbiculare* is being developed for biological control (Tanner 1993).

Distribution

Status/origin: Naturalised exotic, native to S America, known from Bathurst in 1840s, considered naturalised by 1850.
Botanical subregions: NC CC SC CT ST NWS CWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Lane Cove River, Centennial Park, Cooks River, St Marys, Kangaroo Valley, Goodmans Ford, Wolgan River, Clarence (1900).

Habitat

Habitat: Agricultural ground and disturbed pastures.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation:
Substrate: Sandy loam, fertile soils, watertable mostly high. Recorded on saline

sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Widespread and seasonally abundant weed often forming prolific stands after summer rain or flooding. Declared noxious in all Australian states.

Avicennia marina subsp. *australasica* AVICENNIACEAE

Grey Mangrove

Life history

Growth form: Small tree or shrub to 12 m high with aerating roots or pneumatophores, projecting above the surrounding mud. Secretes salt through glands on leaves (West 1985). Multistemmed forms sometimes found (P. Clarke pers. comm.).
Vegetative spread: Occasionally low-lying branches take root and become independent from the adult plant (P. Clarke pers. comm.)
Longevity: Up to 100 years (Clarke 1992).
Primary juvenile period: 5 years (Clarke 1992).
Flowers: February–March, peak March. Flowering of individual trees varies greatly between years and many trees fail to reproduce each year although the populations remain fecund from year to year. Pollen vector most commonly bees, also ants, wasps, bugs (Lygaeidae, Miridae), flies (Cecidomyiidae), bee flies, Cantherid beetles, moths (Pyralidae) (Clarke & Myerscough 1991).
Fruit/seed: Compressed capsule about 3 cm diameter with one seed. 'Seed' mass 5–20 g (P. Clarke pers. comm.), mature October–November, peak November. Seed with two large cotyledons folded longitudinally, germinating before fruit falls. Seed supply not stored on plant.
Dispersal, establishment & growth: Diaspore: germinating seed dropped in December (Hamilton 1919). Dispersed by tidal water, floating in saltwater, sinking in fresh (P. Clarke pers. comm.). Seedlings establish in mud and grow vigorously to about 30 cm high; newly silted areas readily colonised. Optimum growth and establishment occurs just above mid-tide level; seedlings in mature forests grow to about 0.6 m and remain at this height for up to 5 years and die through lack of light and space (State Pollution Control Commission n.d.). Pneumatophore damage may result in plant death (West 1985). Plants may be killed by oil spills (Allaway 1982, Grant et al. 1993).
Fire response: Variable response to high-intensity fire (1/1994) at Lane Cove, some killed others resprouted (P. Kubiak pers. comm.). Canopy killed, resprouts from base (at Breakfast Creek 1994). Can resprout from basal stems, but is also killed if small; killed at Jervis Bay (1989); fires possibly keep it out of the upper saltmarsh (P. Clarke pers. comm.).
Interaction with other organisms: One km^2 of *Avicennia* forest contributes 600 tonnes of leaf litter each year to the detrital food chain (West 1985). Crabs aid the decomposition of leaf litter, 50% eaten (Van der Valk & Attiwill 1984). Flower bud predation by moth larvae (subtribe Phycitina) may be high but had little effect on ovule survival (Clarke 1992).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC; LHI, all mainland States, NG, Pac Is, SE Asia.
Distribution Sydney area: Saltwater swamps and estuaries.
Select locations: Gosford, Broken Bay, Bantry Bay (L.McD.), Middle Harbour Creek (L.McD.), Parramatta River, Cooks River, Botany Bay, Georges River, Lake Illawarra, Minnamurra River.

Habitat

Habitat: Mudflats with tidal inundation; occasionally on rock platforms in sheltered bays (P. Clarke pers. comm.).
Altitude: Sea level only. **Annual rainfall:** Above 1200 mm.
Typical local abundance: Dominant and often monospecific (P. Clarke pers. comm.).
Vegetation: Closed-forest/closed-scrub as sole dominant, occasionally with zones of *Aegiceras corniculata.*
Substrate: In mud, fertile silt and sand deposits below upper tidal limit. Watertable high fluctuating in response to tide, saline.

Exposure: Indifferent to exposure, light. Seedling growth greater in canopy gaps, recruitment to sapling size restricted by light and sediment resources (Clarke & Allaway 1992).

Conservation

Conservation: Extensive reclamation of mangrove areas has destroyed much mangrove habitat, but there has also been some recent expansion of some mangrove areas in response to increased siltation from disturbed catchments. Species adequately conserved, though protection of mangrove forest is important for maintenance of estuarine habitat. Survey estimated 107 km^2 of mangroves in NSW 'a resource needing careful management in the future' (West 1985).

Impatiens walleriana * BALSAMINACEAE

Balsam, Busy Lizzie

Life history

Growth form: Glabrous herb to 1 m high with more or less succulent stems.
Vegetative spread: Can regrow from stem fragments.
Longevity: Short-lived, less than 5 years.
Primary juvenile period: Less than 1 year.
Flowers: Pink–red or white, November–May.
Fruit/seed: Capsule 15 mm long, explosively dehiscent.
Dispersal, establishment & growth: Diaspore: seed, explosively dehisced, dispersed by gravity or water (Anon 1991). Can regrow from dumped stems.
Fire response: Probably killed, flowered within 18 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to southern Africa, cultivated as ornamental, occasionally naturalised.
Botanical subregions: CC.
Distribution Sydney area: Sydney suburban bushland.
Select locations: Wahroonga (M. Clarke pers. comm.), Beecroft, Lane Cove, Clifton Gardens, Minto (1969).

Habitat

Habitat: Gardens, bushland, rubbish dumps. Especially along stormwater drains and creeks (R. Buchanan per. comm.).
Altitude: 0–200 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Moist forest, e.g. with *Eucalyptus pilularis, E. piperita,* or with *Syncarpia glomulifera* (M. Clarke pers. comm.).
Substrate: Enriched sandstone soils, alluvial soils, fertile. Watertable mostly high, intermittent, fresh.
Exposure: Sheltered sites; deep shade–mid shade.

Conservation

Conservation: Occasionally found in sheltered bushland, probably mainly spread in garden refuse. Spread by water in creeks and stormwater drains (R. Buchanan & M. Clarke pers. comm.).

Anredera cordifolia * BASELLACEAE

Madeira Vine, Lamb's Tail, Jalap

Life history

Growth form: Climber with stems to 30 m long producing tubers on roots and at nodes on aerial stems.
Vegetative spread: Aerial and underground tubers (R. Buchanan pers. comm.).
Longevity:
Primary juvenile period:
Flowers: White, fragrant, March.
Fruit/seed: Fruit not set in Australia.

Dispersal, establishment & growth: Diaspore: large underground tubers or clusters of aerial tubers (up to 10 cm diam. in Sydney area, larger on North Coast (M. Clarke pers. comm.); these may remain viable in the soil for many years before sprouting (McLoughlin & Rawling 1990). Dispersal: gravity or water; tubers washed into creeks in stormwater, rubbish dumping.

Fire response: Rarely burnt (R. Buchanan pers. comm.). Resprouted after high-intensity fire (1/1994) at Narrabeen, one seedling observed (P. Kubiak pers. comm.).

Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.

Botanical subregions: NC CC SC NWS CWS NWP.

Distribution Sydney area: Coast.

Select locations: Cheltenham, Eastwood, Balmoral Beach, Glebe Point (1894), Flemington, Royal National Park, Kurrajong, Kangaroo Valley.

Habitat

Habitat: Roadsides, creekbanks, wasteland — sheltered gullies on margins of rainforests and near old settlements.

Altitude: 0–400 m **Annual rainfall:** above 800 mm

Typical local abundance: Frequent.

Vegetation: Margins of rainforest and moist forests. Canopy stratum.

Substrate: Clay soils from Wianamatta Shale, Alluvium. Enriched sandstone, e.g. at Balmoral Beach (M. Clarke pers. comm.). Soil fertile. Watertable mostly low, moisture supply intermittent, fresh.

Exposure: Dense shade–full sun, stem only elongates rapidly in light shade–full sun (R. Buchanan pers. comm.).

Conservation

Conservation: An invasive weed of bushland margins.

Bauera capitata BAUERACEAE

Life history

Growth form: Small diffuse shrub to 30 cm with woody rootstock.

Vegetative spread: Probably not.

Longevity:

Primary juvenile period:

Flowers: Pink, September–October.

Fruit/seed: Capsule, mature October.

Dispersal, establishment & growth: Diaspore: seed.

Fire response: Probably resprouts at ground level or below.

Interaction with other organisms:

Distribution

Status/origin: Native.

Botanical subregions: NC CC; Qld.

Distribution Sydney area: Coast south to La Perouse.

Select locations: Tuggerah (1900), La Perouse (1893–1913).

Habitat

Habitat: Wet heath.

Altitude: 0–30 m **Annual rainfall:** above 1200 mm

Typical local abundance: Now extremely rare or possibly extinct in Sydney region.

Vegetation: Wet heath. Ground stratum.

Substrate: Deep sand, possibly sometimes associated with weathered volcanic dykes?

Exposure:

Conservation

Conservation: Only old records. Probably extinct in the Sydney area, La Perouse is southern limit for the species.

Bauera microphylla BAUERACEAE

Life history

Growth form: Small trailing shrub to 30 cm high.
Vegetative spread: May form adventitious roots but not clear whether capable of spread.
Longevity: ? 25–60 years (D. Keith).
Primary juvenile period: 3–4 years (D. Keith).
Flowers: White–pink, August–January, April–May. Flowers visited by birds and insects, but mostly by small beetles, all of which get well dusted by pollen (Sulman 1914).
Fruit/seed: Capsule which splits lengthwise to release numerous seeds, mature September–November.
Dispersal, establishment & growth: Diaspore: seed, with ant-adapted food body (Westoby et al. 1990), ant-dispersed.
Fire response: Resprouts, seedling recruitment mainly after fire (D. Keith).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC.
Distribution Sydney area: Coast and Blue Mountains (rare), Woronora Plateau.
Select locations: Mangrove Mountain, Gosford, Wahroonga, Centennial Park, Botany, Audley, Heathcote, Appin, Mt Ousley, Lawson (1899), Butlers Swamp.

Habitat

Habitat: Open sandy heath, swamps.
Altitude: 0–900 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent–occasional.
Vegetation: Wet heath, e.g. with *Leptospermum polygalifolium, Banksia ericifolia.* Sedgeland/wet heath, also ecotone area between sedgeland/wet heath and grassland/sclerophyll forest (P. Kodela pers. comm.). Ground stratum.
Substrate: Deep sandy soils on sandstone or dune sand. Peaty soil on wetland, sandy organic soils (P. Kodela pers. comm.). Soil very infertile. Watertable mostly high, moisture supply continuous, fresh.
Exposure: Light shade–full sun.

Conservation

Conservation: Conservation status unknown.

Bauera rubioides BAUERACEAE

Life history

Growth form: Scrambling shrub to 2 m high.
Vegetative spread: No.
Longevity:
Primary juvenile period: 4 years.
Flowers: Pink or white, April–November, peak September.
Fruit/seed: Capsule which splits lengthwise to release numerous seeds. Mature December.
Dispersal, establishment & growth: Diaspore: seed. Dispersal: ant-adapted food body (Westoby et al. 1990).
Fire response: Resprouts at ground level or below. Seedlings can flower within 4 years (after fire, Brisbane Water NP). Killed after high-intensity fire (1/1994) at Lane Cove and Narrabeen, soil-stored seed probably destroyed by high-intensity fire, seedlings in ditches and clifflines where fire intensity lower (P. Kubiak pers. comm.).
Interaction with other organisms: Flowers visited by birds and insects, but mostly by small beetles, all of which get well dusted by pollen (Sulman 1914).

Distribution

Status/origin: Native.
Botanical subregions: CC CT ST; Qld, Vic., Tas., S.A.
Distribution Sydney area: Coast and upper Blue Mountains.
Select locations: West Head Rd, Asquith, Lindfield, Asquith, Marsfield, Oatley, Kentlyn, Appin, Bargo, Mt Wilson, Mt Victoria, Orange.

Habitat

Habitat: Wet and often shaded situations.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Creekside scrub in moist eucalypt open-forest, e.g. with *Eucalyptus piperita, Angophora costata*. Ground–mid-stratum.
Substrate: Damp sandy soil from sandstone. Soil infertile. Watertable mostly high, moisture supply continuous, fresh.
Exposure: Sheltered, mid–light shade.

Conservation

Conservation: Probably adequately conserved. Conserved in Western Sydney (Benson & McDougall 1991).

Berberis aristata * BERBERIDACEAE

Life history

Growth form: Evergreen shrub to 3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow, 10 mm diam.
Fruit/seed: Berry 9–11 mm long, bright red to pruinose blue, mature January–March.
Dispersal, establishment & growth: Diaspore: berry, possibly bird-dispersed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Asia. Cultivated as an ornamental, sometimes naturalised.
Botanical subregions: CC CT NT.
Distribution Sydney area: Southern Highlands and Illawarra.
Select locations: Yerranderie (1953), Macquarie Pass, Bowral (1992), Exeter (1937).

Habitat

Habitat: Rural areas.
Altitude: 0–800 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent.
Vegetation: Disturbed eucalypt woodland, e.g. with *Acacia melanoxylon*.
Substrate: Probably clay soils, fertile, old silver mine area.
Exposure:

Conservation

Conservation: Probably minor weed.

Berberis darwinii * BERBERIDACEAE

Life history

Growth form: Evergreen shrub to 3 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellowish–red, May.
Fruit/seed: Blue berry 6–7 mm long, mature May.
Dispersal, establishment & growth: Bird-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to S America. Cultivated in cooler districts, rarely naturalised.
Botanical subregions: CT.

Distribution Sydney area: Blue Mountains.
Select locations: Mt Wilson (1949).

Habitat

Habitat:
Altitude: 900–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rarely naturalised.

Mahonia leschenaultii * BERBERIDACEAE

Life history

Growth form: Evergreen shrub.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Bright yellow, October (Yass, only record).
Fruit/seed: Blue berry 7–8 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to India, E Asia. Often cultivated as an ornamental occasionally naturalised in gullies in Blue Mountains, or Robertson Plateau (P. Kodela pers. comm.).
Botanical subregions: CT ST.
Distribution Sydney area: Blue Mountains, Southern Highlands.
Select locations: Mt Wilson (1948), Robertson–Wildes Meadow (P. Kodela pers. comm.).

Habitat

Habitat: Gullies.
Altitude: 750–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Rare.
Vegetation: Disturbed moist *Eucalyptus fastigata* forest with rainforest understorey, growing light in gap (P. Kodela pers. comm.).
Substrate: Fertile soil on basalt (P. Kodela pers. comm.).
Exposure:

Conservation

Conservation: Occasionally naturalised.

Macfadyena unguis-cati * BIGNONIACEAE

Cat's Claw Creeper

Life history

Growth form: Woody climber to 30 m, with recurved tendrils; 2 leaflets and terminal leaflet modified into a 3-branched tendril.
Vegetative spread: Underground tuber (R. Buchanan pers. comm.).
Longevity:
Primary juvenile period:
Flowers: Yellow, spring, November.
Fruit/seed: Capsule 14–45 cm long, with winged seeds, 20–40 mm long.
Dispersal, establishment & growth: Diaspore: winged seeds, wind-dispersed (Anon 1991).
Fire response: Resprouts from tubers (R. Buchanan pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Brazil and Argentina; cultivated as an ornamental.
Botanical subregions: NC CC NT; Qld.
Distribution Sydney area: Ourimbah.
Select locations: Ourimbah (1959); Berowra Waters, Epping (R. Buchanan & M. Clarke pers. comm.), North Richmond, Camden.

Habitat

Habitat: Roadside, water's edge.
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation: Disturbed rainforest, tall open-forest (M. Clarke pers. comm.).
Substrate: Alluvial and clay soils, well-drained, very fertile.
Exposure: Deep shade–full sun, stems only elongated rapidly in light shade–full sun (R. Buchanan pers. comm.).

Conservation

Conservation: An aggressive weed in disturbed rainforest and moist eucalypt forest remnants north of Sydney. Localised problem in parts of Sydney, e.g. Berowra Waters (R. Buchanan pers. comm.). Camden Park (M. Clarke pers. comm.).

Pandorea pandorana BIGNONIACEAE

Wonga Wonga Vine

Life history

Growth form: Woody, often tall, glabrous climber, with twining branches.
Vegetative spread: No.
Longevity: Medium-long (? 50–100 years).
Primary juvenile period:
Flowers: Cream with mauve-purple markings, June–November, peak August–September. Bird-pollinated.
Fruit/seed: Capsule 4-6 cm long splitting to release numerous, beautifully-packed winged seeds, 10–15 mm diam. (Sulman 1914). Mature November–January.
Dispersal, establishment & growth: Diaspore: winged seed, wind-dispersed (Westoby et al. 1990). Soil-stored seedbank (Fox 1988).
Fire response: Killed by fire (Fox 1988). Resprouted after high-intensity fire (1/1994) at Lane Cove, a few plants flowering within 26–29 weeks (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP SFWP; LHI, Qld, Vic., N.T., S.A., W.A., NG, Malesia.
Distribution Sydney area: Widespread
Select locations: Wyong, Avoca Beach, Cheltenham, Oatley, Grose Vale, Genbrook, Kentlyn, Razorback, Macquarie Pass, Barren Grounds, Robertson.

Habitat

Habitat: Moist gullies, rocky sites.
Altitude: 0–800 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Coastal rainforest, e.g. with *Ceratopetalum apetalum, Doryphora sassafras, Cupaniopsis anacardioides, Acmena smithii.* Tableland rainforest, e.g. mixed cool temperate/warm rainforest with *Ceratopetalum, Doryphora sassafras, Acmena smithii, Acacia melanoxylon* (P. Kodela pers. comm.). Also a component of dry rainforest vine scrub. Sclerophyll forest and woodland, e.g. with *Syncarpia glomulifera*; often persisting in cleared areas.
Substrate: Medium-high nutrient soils, clay influence, watertable permanently low, moisture supply intermittent.
Exposure: Sheltered sites.

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991). Conservation elsewhere probably adequate.

Pyrostegia venusta * BIGNONIACEAE

Flame Vine

Life history

Growth form: Woody climber.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Reddish orange, spring–summer.
Fruit/seed: Capsule 20–30 cm long, but apparently does not set seed in Australia (Harden 1992).
Dispersal, establishment & growth: Diaspore: probably vegetative.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Brazil and Paraguay. Cultivated, occasionally naturalised in coastal districts.
Botanical subregions: NC CC.
Distribution Sydney area: Lane Cove.
Select locations: Lane Cove (1991) only Sydney record.

Habitat

Habitat: Creekbank.
Altitude: 0–100 m **Annual rainfall:** 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Occasionally naturalised in coastal districts.

Tecoma capensis * BIGNONIACEAE

Cape Honeysuckle

Life history

Growth form: Rambling shrub to 3 m high.
Vegetative spread: Spreads by stoloniferous branches (layering) along ground surface.
Longevity:
Primary juvenile period:
Flowers: Orange to scarlet with much nectar, spring–summer.
Fruit/seed: Capsule 3 cm long, with winged seed 15 mm long.
Dispersal, establishment & growth: Diaspore: seed not set here (L. Johnson pers. comm.).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to S Africa. Cultivated as an ornamental, sometimes as a hedge plant.
Botanical subregions: NC CC.
Distribution Sydney area: Coast.
Select locations: Muogamarra NR, Eastwood (1978), Harbord (1981).

Habitat

Habitat: Disturbed sites.
Altitude: 0–200 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Moist eucalypt forest.
Substrate: Clay soils, fertile.
Exposure:

Conservation

Conservation: Probably just persistent remnant of old gardens or dispersed in garden refuse; fruit not set here (L. Johnson pers. comm.).

Tecoma stans * BIGNONIACEAE

Tecoma

Life history

Growth form: Shrub to 4 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Yellow with reddish lines, spring–summer.
Fruit/seed: Capsule 10–22 mm long, with winged seeds 20 mm long.
Dispersal, establishment & growth: Diaspore: winged seeds.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mexico, Peru & Ecuador. Commonly cultivated as ornamental but rarely naturalised (Harden 1992).
Botanical subregions: NC CC ?SC; Qld.
Distribution Sydney area: North Avoca.
Select locations: Bulbararing Lagoon North Avoca (1990), Lapstone station (1993, P. Kodela pers. comm.).

Habitat

Habitat:
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance:
Vegetation: Disturbed lagoon that previously had *Melaleuca quinquenervia-Casuarina glauca* swamp forest with *Baumea juncea* understorey.
Substrate: Sandy, infertile soil on edge of lagoon. Watertable permanently high, moisture supply continuous, brackish–fresh.
Exposure:

Conservation

Conservation: Reported to be beginning to invade other parts of the Central Coast on a range of soil types (R. Payne pers. comm.).

Amsinckia calycina * (Amsinkia hispida) BORAGINACEAE

Life history

Growth form: Herb 15–50 cm high.
Vegetative spread: No.
Longevity: 6–8 months.
Primary juvenile period: 4–6 months.
Flowers: August–January.
Fruit/seed: Fruit of 4 mericarps, 2–2.5 mm long, November–January. Up to 1600 seeds/plant (Dellow 1989). Seeds remain viable for at least 2 years.
Dispersal, establishment & growth: Diaspore: mericarp, dispersed by livestock and clothing. Low temperatures favour germination. Seeds germinate after autumn rains and there may be up to 4 germinations in a season. Plants grow in winter and die off in late spring–early summer (Dellow 1989).
Fire response:
Interaction with other organisms: Plants or seeds can poison stock if they have access for long periods (Dellow 1989).

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: CC CT ST NWS CWS SWS NWP SWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Western Sydney, but mainly Bathurst–Orange area.
Select locations: Flemington, Campbelltown, Bathurst (1925), Mandurama, Freemantle, Orange, Canobolas.

Habitat

Habitat: Soil dumps, waste and cultivated land.
Altitude: 0–1400 m **Annual rainfall:** 600–1200 mm

Typical local abundance: Occasional.
Vegetation: Winter cereal crops. Ground stratum.
Substrate: Basalt soil, fertile.
Exposure:

Conservation

Conservation: Weed of winter cereal crops (Dellow 1989). Weed of waste and cultivated land.

Amsinckia intermedia * BORAGINACEAE

Common Fiddleneck

Life history

Growth form: Herb 30–100 cm high, with rosette leaves.
Vegetative spread: No.
Longevity: 6–8 months (Dellow 1989).
Primary juvenile period: 4–6 months.
Flowers: Orange-yellow, September–December.
Fruit/seed: Fruit of 4 mericarps, each 3 mm long. Up to 1600 seeds/plant; seeds remain viable for at least 2 years (Dellow 1989).
Dispersal, establishment & growth: Diaspore: mericarp, animal-dispersed on fur and clothing, farm machinery and contaminated grain; probably also bird-dispersed. Farming activities spread the weed over large areas (Parsons 1973). Seeds germinate after autumn rains and there may be up to 4 germinations in a season; low temperatures favour germination but this is not uniform, winter provides ideal conditions; plants grow in winter and die off in late spring–early summer (Dellow 1989).
Fire response:
Interaction with other organisms: Plants or seeds can poison stock if they have access for long periods; seeds can taint and discolour flour made from contaminated seed (Dellow 1989).

Distribution

Status/origin: Naturalised exotic, native to N America. Probably introduced in fodder imported during drought (Parsons 1973). Now spread by contaminated seed wheat.
Botanical subregions: NC CC CT ST NWS CWS SWS NWP SWP; Qld, Vic.
Distribution Sydney area:
Select locations: Concord (1966), Blayney (1903 first record for State), Trunkey, Bathurst, Orange.

Habitat

Habitat: Weed of cultivated land, rubbish tip (Concord).
Altitude: 0–1200 m **Annual rainfall:** 600–1200 mm
Typical local abundance: Frequent.
Vegetation: Winter cereal crops. Ground stratum.
Substrate: Agricultural soils, not confined to any particular soil type (Parsons 1973).
Exposure:

Conservation

Conservation: Weed of winter cereal crops (Dellow 1989).

Anchusa arvensis * (Lycopsis arvensis) BORAGINACEAE

Wild Bugloss

Life history

Growth form: Erect herb to 60 cm high.
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: Blue or rarely whitish, October–December.
Fruit/seed: Mericarp 2 mm long, mature January–May.
Dispersal, establishment & growth: Diaspore: fruit. Seedling recruitment possibly related to disturbance.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NT CT ST NWS CWS SWP; Vic., Tas., S.A.
Distribution Sydney area: Bathurst–Orange.
Select locations: Jenolan Caves (1899), Oberon, Blayney, Orange, Mt Canobolas summit.

Habitat

Habitat: Disturbed sites, e.g. roadsides.
Altitude: 800–1400 m **Annual rainfall:** 800–1200 mm
Typical local abundance: Frequent.
Vegetation: Ruderal weeds, e.g. *Echium, Verbena, Oenothera.* Ground stratum.
Substrate: Agricultural soils, basalt, fertile. Watertable mostly low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Weed of disturbed sites.

Austrocynoglossum latifolium (Cynoglossum latifolium) BORAGINACEAE

Life history

Growth form: Decumbent herb with trailing stems to 1 m long. Stems cling to neighbouring vegetation by means of prickle-like setules (Mill 1989).
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White, November–May.
Fruit/seed: Fruit of 4 spiny mericarps, 3.5 mm long, densely prickly, November–June.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Qld, Vic.
Distribution Sydney area: Illawarra and Western Blue Mountains.
Select locations: Bulli Pass, Macquarie Rivulet, Cambewarra, Robertson, Bilpin, Mt Wilson, Kanangra Deep, Jenolan Caves.

Habitat

Habitat: Typically in rainforest, on damp soil of creek banks, near waterfalls; frequently near or in caves (Mill 1989).
Altitude: 0–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent–occasional.
Vegetation: Moist eucalypt forest and margins of rainforest. Also within rainforest (P. Kodela pers. comm.).
Substrate: Basalt and shale soil, very fertile–fertile. Watertable mostly high, moisture supply intermittent, fresh. Seems to prefer well-drained limestone or basaltic soils (Mill 1989).
Exposure: Sheltered; deep shade.

Conservation

Conservation: Rare close to Sydney area, but more common elsewhere, e.g. in Kowmung area (L. Johnson pers. comm.).

Borago officinalis * BORAGINACEAE

Borage

Life history

Growth form: Herb 30–80 cm high.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period: Less than 1 year.
Flowers: White, spring.
Fruit/seed: Mericarp, 6 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to S Europe. Cultivated, rarely naturalised. Re-establishes from seed in gardens, not seen doing so elsewhere (L. Johnson pers. comm.).
Botanical subregions: CC ST; Vic., S.A., W.A.
Distribution Sydney area:
Select locations: Beecroft, North Sydney (1915), Campbelltown.

Habitat

Habitat: Old gardens, pasture.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation: Old gardens, ground stratum.
Substrate: Probably clay soils, fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Rarely naturalised.

Buglossoides arvensis * (Lithospermum arvense) BORAGINACEAE

Sheepweed

Life history

Growth form: Erect herb to 45 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White–cream, August–October.
Fruit/seed: Fruit of 2 mericarps, 4 mm long.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC NT CT ST NWS CWS SWS NWP SWP NFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Sydney, Orange.
Select locations: Royal Botanic Gardens (1902), Centennial Park, Richmond, Flemington, Casula, Orange (1911), Rylstone.

Habitat

Habitat: Weed of disturbed places, e.g. railway lines.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Rare.
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Weed of disturbed places.

Cynoglossum australe

BORAGINACEAE

Life history

Growth form: Erect herb 30–75 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Blue–whitish, September–March.
Fruit/seed: Fruit of 4 spiny mericarps, densely prickly, mature November–July, peak November.
Dispersal, establishment & growth: Diaspore: mericarp. Seedling recruitment possibly related to soil disturbance.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Coast and Blue Mountains.
Select locations: Howes Valley, Mt Tomah, Sans Souci, Razorback, Douglas Park, Mt Towinhingy, Glanmire, Orange, Abercrombie Caves, Bullio.

Habitat

Habitat: Sites with disturbed soil, e.g. roadside.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Occasional.
Vegetation: Margins of rainforest, wet eucalypt forest in grassy sites, e.g. with *Eucalyptus deanei*. Ground stratum.
Substrate: Mainly on basalt soil but also on sandy soil and skeletal slate soils, fertile–infertile. Watertable mostly low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Vulnerable in Western Sydney (Benson & McDougall 1991). Conservation status elsewhere unknown.

Cynoglossum suaveolens

BORAGINACEAE

Life history

Growth form: Erect herb to 50 cm high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: White or sometimes blue, October–May.
Fruit/seed: Fruit of 4 spiny mericarps, densely prickly, mature November–December.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., Tas., S.A.
Distribution Sydney area: Coast and western Blue Mountains.
Select locations: Colo, Middle Harbour, Georges River, Menangle Park, Mt Victoria, Jenolan Caves, Cullen Bullen, Orange, Bowral.

Habitat

Habitat: Damp places.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Eucalypt open-forest and grassland; ground stratum.

Substrate: Shaley sandstone or clay soils, infertile, damp.
Exposure:

Conservation

Conservation: Not common, probably not well conserved, mostly old records. Vulnerable in Western Sydney (Benson & McDougall 1991).

Echium plantagineum * (Echium lycopsis) BORAGINACEAE

Paterson's Curse, Salvation Jane

Life history

Growth form: Herb to 150 cm high, usually multi-stemmed, with short, stout taproot and numerous laterals, overwinters as rosettes (Parsons & Cuthbertson 1992).
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: Usually less than 1 year (Parson 1973).
Flowers: Purple, pinkish or white, September–April, peak November.
Fruit/seed: Fruit of 4 mericarps, mature December–January, April. Plants produce large amount of seed, most of which falls to ground within a few feet of plant (Parsons 1973). Can produce more than 30, 000 seeds per m^2 (Parsons & Cuthbertson 1992).
Dispersal, establishment & growth: Diaspore: mericarp. Dispersed by animals, water, and as a contaminant of grain (Parsons & Cuthbertson 1992). Seed coat is roughened and seeds can adhere to wool and fur; seeds retain viability after passing through the alimentary tract of animals; seed viability for at least 5 years; cultivation stimulates germination of dormant seed (Parsons 1973). Seed shows considerable innate and temperature enforced dormancy that appears to permit sporadic germination over several seasons (Piggin 1976). Recruitment probably related to moisture availability and temperature. Can germinate at any time, especially autumn; can be found at any time of year in all stages of growth (Parsons 1973). Favoured by Mediterranean-type climate especially in years with early seasonal breaks (Piggin 1976).
Fire response:
Interaction with other organisms: Foodplant of tiger moth caterpillars *Spilosoma glatignyi* and *Utetheisa pulchelloides* (Coupar & Coupar 1992). Used by beekeepers as a source of nectar and pollen (Harden 1991). Seeds eaten by birds, Richard's Pipit *Anthus novaeseelandiae* (Barker & Vestjens 1989,1990). Roots eaten by Sulphur-crested Cockatoo *Cacatua galerita* (Lepschi 1993). Stiff, sharp hairs on stems and leaves are abrasive to skin of humans (Southcott & Haegi 1992). Pollen known to cause allergic rhinitis in humans (Bass 1987). Cattle and horses usually avoid the plant; particularly poisonous to pigs and horses, causes liver damage, it is also mutagenic and possibly carcinogenic (Parsons & Cuthbertson 1992). Biological control using Echium Leaf-miner *Dialectica scalariella* since 1988, other control agents being released are root feeding Echium Weevils *Ceutorhynchus geographicus* and *C. larvatus* (Tanner 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe. Recorded at Camden in 1843, introduced by John Macarthur as an ornamental (Parsons & Cuthbertson 1992).
Botanical subregions: NC CC SC NT **CT** ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Terrigal, Pennant Hills, Richmond, Doonside, Glenfield, Mt Annan, Bomaderry, Carcoar (1915), Rockley, Orange, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Roadsides and pastoral land.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Frequent.
Vegetation: Woodland, grassland.
Substrate: Shale, basalt — fertile soil. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Full sun.

Conservation

Conservation: Regarded as a weed in cultivated and pastoral land.

Echium vulgare * BORAGINACEAE

Viper's Bugloss

Life history

Growth form: Herb, to 90 cm high.
Vegetative spread: No.
Longevity: 2 years, but sometimes perennial (Parsons 1873).
Primary juvenile period:
Flowers: Blue, November–April.
Fruit/seed: Fruit of 4 mericarps, mature April.
Dispersal, establishment & growth: Diaspore: mericarp. Large amounts of seed produced, most falls to ground within a few feet of plant. Seeds spread by movement of stock and fodder, can pass through alimentary tract of animals and remain viable, can adhere to wool and fur. 80% germination for 1–2 years but can lie dormant for at least 5 years. Seedling recruitment from soil-stored seed possibly related to disturbance (Parsons 1973).
Fire response:
Interaction with other organisms: Causes liver damage in stock. Important throughout history in herbal medicine, used as a diuretic and treatment for fevers, headaches etc. (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to Europe. Introduced to Australia in 1820 (Parsons & Cuthbertson 1992).
Botanical subregions: NC NT CT ST NWS SWS NWP; Vic., Tas., S.A.
Distribution Sydney area: Bathurst–Lithgow area, Southern Highlands.
Select locations: Glen Alice, Portland, Lithgow, Cox River (1909), Raglan, Tarana, Oberon, Rockley, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Disturbed sites, roadsides, pastoral land, wasteland.
Altitude: above 800 m **Annual rainfall:** 800–1200 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt woodland, e.g. *Eucalyptus bridgesiana, E. polyanthemos, E. albens, E. melliodora* with ruderal weeds, e.g. *Echium plantagineum, Cirsium vulgare*. Ground stratum.
Substrate: Loamy soils from granite. Wide variety of soils (Parsons & Cuthbertson 1992).
Exposure:

Conservation

Conservation: Weed of pastoral land.

Ehretia acuminata var. *acuminata* BORAGINACEAE

Koda

Life history

Growth form: Tree to 30 m high with creamy-brown bark, often more or less deciduous, with new growth in spring.
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: White, strongly scented, October–January, peak December.
Fruit/seed: Orange-yellow drupe 5–7 mm diam., breaking into pyrenes at maturity, February–March.
Dispersal, establishment & growth: Diaspore: fruit, probably bird-dispersed. Germination of sown fresh seed very rapid, 28% germination after 20 days (Floyd 1989).
Fire response:
Interaction with other organisms: Fruit eaten by Brown Cuckoo-Dove, Figbird, Green Catbird, Lewin's Honeyeater, Rose-crowned Fruit-dove, Wompoo Fruit-dove (Floyd 1989). Timber used for furniture, resembles English Elm (Floyd 1983).

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT CWS; Qld.
Distribution Sydney area: Coast and coastal ranges.

Select locations: Ourimbah Creek, Grose Vale, Cobbitty, Razorback, Kowmung, Barrengarry, Saddleback, Minnamurra Falls, Kangaroo Valley.

Habitat

Habitat: Rainforest along creeks.
Altitude: 0–300 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional–rare.
Vegetation: Warmer rainforest, especially near the margins or in disturbed areas, e.g. with *Doryphora sassafras, Toona ciliata, Acmena smithii, Cryptocarya glaucescens.* Canopy stratum.
Substrate: Deep sandy alluvium along creeks, sometimes on basalt. Fertile soil. Watertable mostly high, non-saline.
Exposure: Sheltered situations.

Conservation

Conservation: Conservation status unknown. Fairly common in marginal rainforest area (L. Johnson pers. comm.).

Halgania brachyrhyncha BORAGINACEAE

Life history

Growth form: Spreading–semi-prostrate subshrub 0.3–0.6 m high.
Vegetative spread:
Longevity:
Primary juvenile period:
Flowers: Deep blue, September–February.
Fruit/seed: Leathery drupe 4–5 mm long, with 1–2 seeds.
Dispersal, establishment & growth: Diaspore: drupe.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC CWS; Qld.
Distribution Sydney area: Burragorang Valley.
Select locations: Burragorang Valley (The Sheepwalk 1967) only record for area.

Habitat

Habitat: Rocky sites particularly ridges or hillsides.
Altitude: 200 m **Annual rainfall:** 800 mm
Typical local abundance:
Vegetation: Tall shrubland to woodland and open-forest. Ground stratum.
Substrate: Sandstone or conglomerate. Infertile soil.
Exposure:

Conservation

Conservation: Rare, only known from a few localities (Wilson 1990), conservation status unknown.

Heliotropium amplexicaule * BORAGINACEAE

Blue Heliotrope

Life history

Growth form: Perennial herb to 15 cm high with deep taproot.
Vegetative spread: No.
Longevity:
Primary juvenile period:
Flowers: Purple or lilac, November–March.
Fruit/seed: Fruit of 2 mericarps, succulent at first, becoming wrinkled and falling at maturity, November–March.
Dispersal, establishment & growth: Diaspore: mericarp, shed at maturity. A summer-growing perennial that dies back in winter and regrows from the taproot in spring.
Fire response:

Interaction with other organisms: Contains toxic alkaloids, suspected of causing jaundice in sheep (Mitchell 1988).

Distribution

Status/origin: Naturalised exotic, native to S America. Probably introduced as a garden plant.
Botanical subregions: NC CC SC NT CT NWS CWS NWP NFWP; Qld, Vic., S.A.
Distribution Sydney area: Widespread.
Select locations: Barrenjoey, Ermington, Summer Hill (1913), Agnes Banks, Penrith, Ingleburn, Mt Annan, Bathurst.

Habitat

Habitat: Roadsides, creekbanks, degraded and overstocked pastures.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Occasional.
Vegetation: Ephemeral weeds or woodland, e.g. with *Eucalyptus tereticornis*. Ground stratum.
Substrate: Generally restricted to well drained alluviums and medium to sandy soils (Mitchell 1988), fertile–infertile.
Exposure:

Conservation

Conservation: Major agricultural weed in upper reaches of Macquarie River, but not an invader of bushland. Declared noxious weed in some shires of NSW.

Heliotropium europaeum BORAGINACEAE

Common Heliotrope, Potato Weed

Life history

Growth form: Herb, erect, to 30 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, February–March.
Fruit/seed: Fruit of mericarps 4, shed at maturity, March–April.
Dispersal, establishment & growth: Diaspore: mericarp. Spring and summer-growing annual.
Fire response:
Interaction with other organisms: May cause jaundice in sheep, cumulative effects resulting in death (Mitchell 1988). Foodplant of tiger moth caterpillar *Utetheisa pulchelloides* (Coupar & Coupar 1992). Rust Fungus *Uromyces heliotropii* has been released for biological control (Keech & Tanner 1993).

Distribution

Status/origin: Cosmopolitan. Has been regarded as introduced and naturalised in Australia, but is now considered to be cosmopolitan (Harden 1992).
Botanical subregions: NC CC CT ST NWS CWS SWS NWP SWP NFWP SFWP; Vic., S.A., W.A., SW Asia & Europe.
Distribution Sydney area:
Select locations: Royal Botanic Gardens, Flemington (1969), Glenfield (1969).

Habitat

Habitat: Earthworks and garden beds.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation: Disturbed sites.
Substrate: Clay soil. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Myosotis australis BORAGINACEAE

Australian Forget-me-not

Life history

Growth form: Herb 20–40 cm high.
Vegetative spread:
Longevity: Annual or perennial.
Primary juvenile period:
Flowers: White or yellowish or rarely bluish, November–December.
Fruit/seed: Fruit of 4 mericarps.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC SC NT CT ST NWS CWS SWS; Vic., Tas., S.A, W.A.
Distribution Sydney area: Blue Mountains and westward. Southern Highlands (P. Kodela pers. comm.).
Select locations: Mt Tomah, Jenolan Caves, Mt Shivering, Mt Canobolas, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Rocky hillsides.
Altitude: 800–1400 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Open-forest, e.g. *Eucalyptus fastigata, E. viminalis, Pellaea falcata.* Ground stratum.
Substrate: Basalt soil, fertile. Watertable mostly low, non-saline.
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Myosotis caespitosa * BORAGINACEAE

Life history

Growth form: Herb 10–35 cm high.
Vegetative spread:
Longevity: Annual.
Primary juvenile period: 1 year.
Flowers: Pale blue changing to pink, spring–summer.
Fruit/seed: Fruit of 4 mericarps.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic (P. Kodela pers. comm.), native to Europe.
Botanical subregions: NC NT CT ST CWS.
Distribution Sydney area: Southern Highlands.
Select locations: Burrawang–Robertson (1992).

Habitat

Habitat: Disturbed roadside.
Altitude: 700 m **Annual rainfall:** 1600 mm
Typical local abundance: Occasional.
Vegetation: With grasses and other herbs, near pastures.
Substrate:
Exposure:

Conservation

Conservation: Localised minor weed of roadsides.

Myosotis discolor * BORAGINACEAE

Forget-me-not

Life history

Growth form: Herb 10–20 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellowish–blue, October–November.
Fruit/seed: Fruit of 4 mericarps.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe. *Myosotis caespitosa* and *M. sylvatica* also naturalised in Sydney area at Robertson (P. Kodela pers. comm.).
Botanical subregions: CT ST NWS SWS; Vic., Tas.
Distribution Sydney area:
Select locations: Jenolan Caves, Abercrombie Caves, Mt Jellore, Canobolas SF.

Habitat

Habitat: Rocky crevices.
Altitude: 700–1000 m **Annual rainfall:** 800–1000 mm
Typical local abundance: Frequent.
Vegetation: Open-woodland, e.g. with *Eucalyptus dives* and *Cassinia* understorey. Ground stratum.
Substrate: Rocky crevices on limestone, occasionally volcanic rocks. Soil fertile.
Exposure: Sheltered.

Conservation

Conservation:

Myosotis exarrhena (Myosotis suaveolens) BORAGINACEAE

Life history

Growth form: Herb 30–50 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Pale blue or white, October.
Fruit/seed: Fruit of 4 mericarps.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas.
Distribution Sydney area: Jenolan Caves.
Select locations: Jenolan Caves (1899) only Sydney record.

Habitat

Habitat:
Altitude: 800 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate: Probably on limestone soil.
Exposure:

Conservation

Conservation: Rare, conservation status unknown.

Myosotis sylvatica * BORAGINACEAE

Wood Forget-me-not

Life history

Growth form: Herb to 40 cm high, with hairs on stems and leaves.
Vegetative spread:
Longevity: 2 years, biennial or perennial.
Primary juvenile period:
Flowers: Bright blue with yellow throat, spring–summer.
Fruit/seed: Fruit of 4 mericarps.
Dispersal, establishment & growth: Diaspore: mericarp.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe, introduced as garden plant, sometimes naturalised.
Botanical subregions: CT ST; Vic., Tas., S.A.
Distribution Sydney area: Southern Highlands.
Select locations: Kangaloon (1993).

Habitat

Habitat: Roadside.
Altitude: 800 m **Annual rainfall:** 1600 mm
Typical local abundance: Frequent.
Vegetation: With roadside weeds, e.g. *Holcus lanatus, Dactylis globerata, Bromus catharticus* etc.
Substrate:
Exposure: Mid shade.

Conservation

Conservation: Rare in Sydney area, probably only localised garden escape (P. Kodela pers. comm.).

Barbarea verna * BRASSICACEAE

Wintercress

Life history

Growth form: Erect herb to 75 cm high.
Vegetative spread:
Longevity: 2 years.
Primary juvenile period:
Flowers: Yellow.
Fruit/seed: Capsule (siliqua) 3–7 cm long, with row of seeds, mature February.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe. Garden escape, rarely naturalised.
Botanical subregions: CC; Vic., Tas., S.A.
Distribution Sydney area:
Select locations: Wahroonga (1917). (Only one specimen available.)

Habitat

Habitat:
Altitude: 200 m **Annual rainfall:** 1300 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Garden escape, rarely naturalised. Not recorded in the last 75 years.

Brassica fruticulosa *

BRASSICACEAE

Twiggy Turnip

Life history

Growth form: Herb, erect, to 50 cm high.
Vegetative spread: No.
Longevity: Less than 5 years.
Primary juvenile period:
Flowers: Pale yellow-white, April–November.
Fruit/seed: Capsule (siliqua) 2–4 cm long, with small seeds, mature April–November.
Dispersal, establishment & growth: Diaspore: seed.
Fire response: Probably killed, flowering within 12 weeks, seeds released within 28 weeks of high-intensity fire (1/1994) at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic. Native to S Europe and N Africa. Supposedly originally introduced from Italy as a vegetable (note with Herbarium specimen).
Botanical subregions: NC CC CT; Vic.
Distribution Sydney area: Sydney suburbs, Katoomba.
Select locations: Beecroft, West Ryde (1949), Northbridge, Dobroyd Point, La Perouse, Mortdale, Liverpool, Echo Point (1966).

Habitat

Habitat: Disturbed sites, roadsides, creek banks, embankments, railway edges.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Herbaceous weeds. Ground stratum.
Substrate: Various — sandy soil, reclaimed sites; also on highly disturbed Wianamatta Shale around Marsfield (L.Johnson pers. comm.).
Exposure:

Conservation

Conservation: Appears mainly confined to suburban areas, often in soil-fill.

Brassica juncea *

BRASSICACEAE

Indian Mustard

Life history

Growth form: Herb to 1 m high, with slender taproot (Häfliger 1988).
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Pale yellow, spring.
Fruit/seed: Capsule (siliqua), 2–6 cm long, 2–4 mm wide, with 16–24 seeds, 1.3–1.6 mm long, dark reddish brown to yellowish (Häfliger 1988), mature October.
Dispersal, establishment & growth: Diaspore: seed. Winter-growing annual.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe and Asia.
Botanical subregions: CC NT ST CWS SWP; Qld, S.A., W.A.
Distribution Sydney area: Hornsby.
Select locations: Hornsby (1924), Casula (1967), Belrose (P. Kodela pers. comm.).

Habitat

Habitat: Agricultural lands, railway line, roadsides.
Altitude: 0–100 m **Annual rainfall:** 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Weed of agricultural lands and roadsides.

Brassica rapa **subsp.** ***silvestris*** * BRASSICACEAE

Turnip

Life history

Growth form: Herb to 1 m high; tap root sleek, often tuberous (Lamp & Collet 1989).
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Bright yellow, April–November.
Fruit/seed: Capsule 4–7 cm long, with small seeds, mature April–November.
Dispersal, establishment & growth: Diaspore: probably seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe. Introduced as food plant.
Botanical subregions: NC CC NT CT ST CWS SWS SWP NFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Coastal.
Select locations: Wondabyne, Glenorie, Hornsby (1909), Mosman, La Perouse, Glenfield, Albion Park, Meadow Flat Creek.

Habitat

Habitat: Disturbed sites and roadsides.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional.
Vegetation: Roadside weed species. Ground stratum.
Substrate: Alluvial and clay soils, fertile.
Exposure:

Conservation

Conservation: Widely cultivated and established as minor weed of disturbed sites.

Brassica tournefortii * BRASSICACEAE

Mediterranean Turnip

Life history

Growth form: Herb with mostly basal leaves, to 60 cm high; long taproot (Häfliger 1988).
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Pale yellow–white, August–October.
Fruit/seed: Capsule (siliqua), 3–7 cm long, 3 mm wide, splitting at maturity, August–October. Seeds reddish-brown, 2 mm diam, about 16 per capsule.
Dispersal, establishment & growth: Diaspore: seed. Possibly wind-dispersed (Carr et al. 1992).
Fire response:
Interaction with other organisms: Rarely grazed by stock (Cunningham et al. 1981).

Distribution

Status/origin: Naturalised exotic, native to Mediterranean.
Botanical subregions: NC CC ST SWS NWP SWP NFWP SFWP; all mainland States.
Distribution Sydney area: Coast.
Select locations: Tuggerah Beach, Richmond, Woolooware Bay, Wollongong (1948).

Habitat

Habitat: Coastal dunes.
Altitude: 0–100 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Scrub with *Leptospermum laevigatum, Acacia longifolia* var. *sophorae.*
Substrate: Sandy coastal dune soils — unstable. Soil infertile. Watertable permanently low, moisture supply intermittent.
Exposure:

Conservation

Conservation: Widespread aggressive weed. Also occurs on sand in inland regions, e.g. Western Plains (L. Johnson pers. comm.).

Cakile edentula * BRASSICACEAE

American Sea Rocket

Life history

Growth form: Herb to 80 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, pink or lavender, all year.
Fruit/seed: Capsule (silicula) 12–24 mm long, corky, breaking into two segments (usually 1 seed in each) and capable of floating in seawater for 10 weeks with encased seeds remaining viable (Rodman 1986). Mature March–June.
Dispersal, establishment & growth: Diaspore: silicula segments, local and widespread dispersal by water, local wind dispersal of plant as tumbleweed. Germination 59%, 1 week from sowing after scarification (Rodman 1986). Seeds not viable after burial (Clarke 1989). Seedlings sun-tolerant (Clarke 1989).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to N America. Probably introduced to Australia in ship ballast.
Botanical subregions: NC CC SC; LHI, Qld, Vic., Tas., W.A.
Distribution Sydney area: Coastline.
Select locations: Wyong, Palm Beach, Manly (1870), Bondi (1884), La Perouse, Lady Robinson Beach, Kurnell, Wollongong, Austinmer, Seven Mile Beach.

Habitat

Habitat: Beach dunes and lake foreshores.
Altitude: 0–50 m **Annual rainfall:** above 1200 mm
Typical local abundance: Occasional.
Vegetation: Strand zones.
Substrate: Sand dunes, infertile soil.
Exposure:

Conservation

Conservation: First recording for NSW at Manly Beach in 1870 after being introduced in Victoria (Rodman 1986).

Cakile maritima * BRASSICACEAE

Sea Rocket

Life history

Growth form: Herb with ascending or decumbent branches to 80 cm long.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period:
Flowers: White–purple, August–September.
Fruit/seed: Capsule (silicula) 12–27 mm long, corky. Upper fruit segment capable of floating in seawater for 2 weeks and encased seeds remain viable even after 10 weeks' exposure to seawater (Rodman 1986).
Dispersal, establishment & growth: Diaspore: silicula segments, local and widespread dispersed by water; local wind dispersal of plant as tumbleweed. Germination 95%, 1 week from sowing after scarification (Rodman 1986).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe and Africa. Probably introduced to Australia in ships' ballast (Rodman 1986).
Botanical subregions: CC SC NFWP; Vic., Bass Strait Is, S.A., W.A.
Distribution Sydney area: Coastline: Broken Bay–Botany Bay.
Select locations: Ettalong Beach (1969), Palm Beach, Belrose (P. Kodella), Towra Point (1977).

Habitat

Habitat: Beaches and foreshores. Rarely away from coast, e.g. Belrose (P. Kodela pers. comm.).
Altitude: 0–2 m **Annual rainfall:** above 1200 mm
Typical local abundance: Rare.
Vegetation: Strand zone. Ground stratum.
Substrate: Beach sand, infertile. Rarely sandy soil on sandstone (P. Kodela pers. comm.).
Exposure: Exposed situations.

Conservation

Conservation: Ettalong Beach is current northern limit and first record for NSW. It was first collected near Perth at the turn of the century, giving an estimated migration rate of 95 km per year (Rodman 1986).

Camelina alyssum * BRASSICACEAE

Stinking Flaxweed

Life history

Growth form: Slender herb with flowers in racemes.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Pale yellow.
Fruit/seed: Capsule (silicula) 6–12 mm long, with small seeds, mucilaginous when wet.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC; Tas., S.A.
Distribution Sydney area: Parramatta.
Select locations: Parramatta (von Mueller, 19th century), no recent records.

Habitat

Habitat: Pasture weed.
Altitude: 0–50 m **Annual rainfall:** 1000 mm
Typical local abundance:
Vegetation: Pasture. Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Pasture weed, rare.

Capsella bursa-pastoris * BRASSICACEAE

Shepherd's Purse

Life history

Growth form: Erect herb 8–40 cm high, basal leaves in a rosette; taproot, becoming woody (Häfliger 1988).
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, May–December, peak September.
Fruit/seed: Capsule (silicula) 6–9 mm long, with small seeds, mature July–November.
Dispersal, establishment & growth: Diaspore: seed, animal and possibly wind-dispersed (Carr et al. 1992). Seedling: dark green, cotyledons petiolate, elliptical to oblong, 2–4 mm long (Häfliger 1988).
Fire response: Probably killed, seedlings seen, 1 plant flowering and fruiting within 20 weeks of high-intensity fire 1/1994 at Narrabeen (P. Kubiak pers. comm.).
Interaction with other organisms: Seed eaten by Galah *Cacatua roseicapilla* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP NFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Sydney suburban area, Bathurst–Orange, Southern Highlands (P. Kodela pers. comm.).
Select locations: Curl Curl, Wollstonecraft, Technical College (1893), Flemington, Glenfield, Narellan, Wollongong, Bathurst, Orange, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Roadsides and footpaths, pastures.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Frequent.
Vegetation: Amongst other wasteland weeds. Ground stratum.
Substrate: Fertile soil. Watertable permanently low, moisture supply intermittent, fresh. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Common weed of roadsides and footpaths, does not invade bushland.

Cardamine flexuosa * BRASSICACEAE

Wood Bittercress

Life history

Growth form: Herb to 50 cm high.
Vegetative spread: No.
Longevity: 1 year (rarely perennial in Australia).
Primary juvenile period: Less than 1 year.
Flowers: White, sepals green–violet, March–September.
Fruit/seed: Capsule (siliqua) 10–25 mm long, with small seeds ejected suddenly at maturity, March–September.
Dispersal, establishment & growth: Diaspore: seed, ejected mechanically.
Fire response: Probably killed, fruiting within 15 weeks of high-intensity fire 1/1994 at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC.
Distribution Sydney area: Sydney suburban areas.
Select locations: Royal Botanic Gardens (1964), Padstow, Glenfield.

Habitat

Habitat: Garden beds.
Altitude: 0–300 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation:
Substrate: Moist garden beds, fertile.
Exposure:

Conservation

Conservation: Weed in moist garden sites, not invasive of bushland. Has increased greatly in past 30 years in moist garden sites; first appeared in nurseries (L. Johnson pers. comm.).

Cardamine gunnii BRASSICACEAE

Life history

Growth form: Robust herb, variable leaves entire–pinnatisect.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:

Flowers: White, August–October.
Fruit/seed: Capsule (silicula) 15–30 mm long, with small seeds ejected suddenly at maturity.
Dispersal, establishment & growth: Diaspore: seed, ejected mechanically. Seedling recruitment possibly related to disturbance.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas., S.A.
Distribution Sydney area: Northern Blue Mountains.
Select locations: Mt Coricudgy, Mt Durambang, Mt Tayar, Gosling Creek, McKeons Creek (Jenolan Caves).

Habitat

Habitat: Moist forest.
Altitude: 500–1000 m **Annual rainfall:** above 900 mm
Typical local abundance: Frequent.
Vegetation: Moist eucalypt forest, e.g. *Eucalyptus blaxlandii, E. viminalis.* Ground stratum.
Substrate: Clay loam on basalt, limestone, very fertile. Watertable mostly high, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Conservation status unknown.

Cardamine hirsuta * BRASSICACEAE

Common Bittercress, Hairy Woodcress

Life history

Growth form: Slender herb to 30 cm high; taproot slender, much branched, yellowish (Häfliger 1988).
Vegetative spread: No (M. Clarke pers. comm.).
Longevity: 1 year.
Primary juvenile period: 6 months (P. Kubiac pers. com.).
Flowers: White, sepals green to violet, August–November.
Fruit/seed: Capsule (siliqua) 15–20 mm long, with small seeds ejected suddenly at maturity, August–November.
Dispersal, establishment & growth: Diaspore: seed, ejected mechanically, animal and possibly wind-dispersed (Carr et al. 1992). Water-dispersed (M. Clarke pers. comm.).
Fire response: Probably killed, flowering and fruiting within 24 weeks of high-intensity fire 1/1994 at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC ST NWS SWS; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Suburban areas.
Select locations: Cheltenham, Willoughby, Cremorne, Woolwich (1984), Centennial Park, Croydon Park.

Habitat

Habitat: Lawns and gardens, or disturbed sites, nurseries.
Altitude: 0–100 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Lawns and gardens. Ground stratum.
Substrate: Garden soils, sandy, clay/shales, fertile–infertile, damp, non-saline.
Exposure: Dense–light shade (M. Clarke pers. comm.).

Conservation

Conservation: Confined to gardens and lawns. Watercourses, and stormwater outlets, invades bushland creeks.

Cardamine lilacina BRASSICACEAE

Life history

Growth form: Herb to 50 cm high.
Vegetative spread: No.
Longevity: 1–5 years.
Primary juvenile period:
Flowers: Pink–purple, sepals purple with white margins, October–November.
Fruit/seed: Capsule (siliqua) 10–40 mm long, with small seeds ejected suddenly at maturity.
Dispersal, establishment & growth: Diaspore: seed, ejected mechanically.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas.
Distribution Sydney area: Western Blue Mountains, Southern Highlands.
Select locations: Mt Coricudgy, Coxs River (1904), Oberon, Wombeyan, Wingecarribee Swamp (1966).

Habitat

Habitat: Swamp, grassland, forest understorey.
Altitude: 650–800 m **Annual rainfall:** above 800 mm
Typical local abundance:
Vegetation: *Epacris paludosa–Sphagnum* bog and adjacent grassland, and forest, e.g. with *Eucalyptus dalrympleana* in herbaceous understorey. Ground stratum.
Substrate: Granite, basalt, clay-loam, fertile–infertile soil. Watertable mostly high, moisture supply intermittent, fresh.
Exposure: Light shade–full sun.

Conservation

Conservation: Probably rare and poorly conserved.

Cardamine paucijuga BRASSICACEAE

Life history

Growth form: Weak herb to 40 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White or rarely pink, August–December.
Fruit/seed: Capsule (siliqua) 10–30 mm long, with small seeds ejected suddenly at maturity, October.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST NWS SWS; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Western Blue Mountains, Southern Highlands.
Select locations: Cheltenham, Maldon, Yerranderie, Mt Cameron, Little Hartley, Hill Top, Robertson (P. Kodela pers. comm.), Marulan.

Habitat

Habitat: Moist areas near creek banks.
Altitude: 0–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent–occasional.
Vegetation: Moist eucalypt forest, e.g. *Eucalyptus viminalis*, or with *Persicaria* spp. Ground stratum.
Substrate: River gravels, river flat alluvium, granite and basalt. Soil very fertile–fertile.

Watertable mostly high, moisture supply intermittent, fresh.
Exposure: Sheltered situations.

Conservation

Conservation: Probably becoming rare, conservation status unknown.

Cardamine species ***Y*** BRASSICACEAE

Life history

Growth form: Herb to 40 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White or pink, September–November.
Fruit/seed: Capsule (siliqua) 15–30 mm long, with small seeds ejected suddenly at maturity.
Dispersal, establishment & growth: Diaspore: seed, ejected mechanically.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT ST; Vic., Tas., S.A.
Distribution Sydney area:
Select locations: Rylstone, Coxs River, Orange, Oberon, Wombeyan.

Habitat

Habitat: Wet places, creeks.
Altitude: 800–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Undisturbed swamp vegetation and grassland. Ground stratum.
Substrate: Basalt, granite soils, fertile–infertile. Watertable mostly high, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Probably now rare, conservation status unknown.

Cardaria draba * (Lepidium draba) BRASSICACEAE

Hoary Cress, White Weed

Life history

Growth form: Herb 15–cm high with extensive and deep root system; taproot and horizontal creeping roots with adventitious buds (Häfliger 1988). Erect, branching near the top, covered with fine downy hairs; main root 2 m deep (Parsons & Cuthbertson 1992).
Vegetative spread: Capable of vegetative spread; severed portions of the root system readily bud to form new plants Scurfield 1962). Horizontal roots produce aerial shoots (Parsons & Cuthbertson 1992).
Longevity: Perennial.
Primary juvenile period: 2 years.
Flowers: Not usually produced until 2nd year, white, October–November.
Fruit/seed: Capsule (silicula) 3–4 mm long separating into 1 or 2-seeded units (nutlets), red-brown, 2.2 mm long. Single plant can produce 1000–5000 seeds (Parsons & Cuthbertson 1992).
Dispersal, establishment & growth: Diaspore: 1 or 2-seeded nutlets. High seed production and germination percentages. Non-dormant fraction 93% with germination decreasing with age, and zero after 3 years (Scurfield 1962 in Cunningham et al. 1981). Germinates in autumn to form rosettes in winter and spring. Flowering does not usually occur in the first year but older plants flower in spring after which the above-ground parts die off (Cunningham et al. 1981).

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic. Native to S Europe.
Botanical subregions: CC NT CT ST NWS CWS SWS SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Campbelltown, Bathurst–Orange area.
Select locations: Campbelltown, Bathurst (1901), Orange.

Habitat

Habitat: Roadsides, gardens and waste land.
Altitude: 0–1000 m **Annual rainfall:** above 400 mm (Parsons & Cuthbertson 1992)
Typical local abundance:
Vegetation: Ground stratum.
Substrate: Dry, uncultivated, heavy, fertile soils (Parsons & Cuthbertson 1992).
Exposure: Would appear to be able to withstand prolonged cold (Scurfield 1962). Unshaded (Parsons & Cuthbertson 1992).

Conservation

Conservation: Widespread agricultural weed — not common.

Conringia orientalis * **BRASSICACEAE**

Hare's Ear, Treacle Mustard

Life history

Growth form: Erect herb 10–50 cm high, glabrous and glaucous; short whitish taproot (Häfliger 1988).
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow or greenish white, October.
Fruit/seed: Capsule (siliqua) 4–14 mm long, with small seeds, mature November.
Dispersal, establishment & growth: Diaspore: seed. Seedling: cotyledons petiolate, elliptical to ovate (Häfliger 1988).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe.
Botanical subregions: CC NWS CWS; Qld, Vic., S.A.
Distribution Sydney area:
Select locations: Royal Botanic Gardens (1896) only record.

Habitat

Habitat: Weed of agricultural land.
Altitude: 0–50 m **Annual rainfall:** 1200 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: No records since 1896, not naturalised in the Sydney area.

Coronopus didymus * **BRASSICACEAE**

Lesser Swinecress

Life history

Growth form: Herb to 30 cm high; with taproot (Häfliger 1988).
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: White, less than 2 mm long, September.

Fruit/seed: Capsule (silicula) 1.5 mm long, separating at maturity into 2 1-seeded nutlets 1–2 mm diam., mature any time of year.
Dispersal, establishment & growth: Diaspore: nutlet. Seedling: cotyledons petiolate, club-shaped (Häfliger 1988). Late winter–early spring growing.
Fire response: Probably killed, fruiting within 15 weeks of high-intensity fire 1/1994 at Lane Cove, seedlings observed (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic. Native to America and Europe.
Botanical subregions: NC CC SC ST NWS SWS NWP SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Sydney suburbs and Western Sydney.
Select locations: Woy Woy, Cheltenham, Homebush (1893), Neutral Bay, Royal Botanic Gardens, Shane Park, Richmond, Leuhmeah, Wollongong, Albion Park.

Habitat

Habitat: Lawns, gardens, roadsides, wasteland.
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: With other weeds of wasteland. Ground stratum.
Substrate: Mainly fertile clay soils from Wianamatta Shale but also sandy soils.
Exposure:

Conservation

Conservation: Weed of disturbed sites, unlikely to invade bushland.

Diplotaxis muralis * BRASSICACEAE

Wall Rocket

Life history

Growth form: Herb to 60 cm high, with taproot.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Lemon-yellow sometimes becoming violet after flowering, September.
Fruit/seed: Cylindrical capsule (siliqua) 3–4 cm long, opening when ripe, September. Numerous seeds, yellow brown 1.2 mm long.
Dispersal, establishment & growth: Diaspore: seed. Seedling: light green, cotyledons petiolate, roundish-elliptical, apex emarginate (Häfliger 1988).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic. Native to Europe.
Botanical subregions: CC CWS NFWP SFWP; Vic., Tas., S.A., W.A.
Distribution Sydney area: Campbelltown.
Select locations: Campbelltown (1954) only record.

Habitat

Habitat: Roadside gravel dump.
Altitude: 0–50 m **Annual rainfall:** 750 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate: Roadside gravel dump.
Exposure:

Conservation

Conservation: Widespread weed, only Sydney record Campbelltown (1954).

Drabastrum alpestre BRASSICACEAE

Mountain Cress

Life history

Growth form: Herb or subshrub 10–30 cm high, woody base and rhizome.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White or lavender.
Fruit/seed: Capsule (siliqua) 4–10 mm long, with small seeds.
Dispersal, establishment & growth: Diaspore: seed, mucilacinous when wet.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CT ST; Vic.
Distribution Sydney area: Bathurst (Harden 1990).
Select locations: No specimens in NSW Herbarium.

Habitat

Habitat:
Altitude: Probably above 1000 m **Annual rainfall:** 600–1000 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Rare, coded 3RC- (Briggs & Leigh 1988), Bathurst district is northern limit, conservation status unknown.

Erophila verna subsp. *praecox* * BRASSICACEAE

Whitlow Grass

Life history

Growth form: Herb 3–20 cm high; taproot slender, much branched, yellowish (Häfliger 1988).
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period:
Flowers: White or pink, September.
Fruit/seed: Capsule (silicula) 3–6 mm long, with numerous minute seeds, mature September.
Dispersal, establishment & growth: Diaspore: seed. Seedling: cotyledons petiolate, elliptical to roundish, c. 1 mm long (Häfliger 1988).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Europe.
Botanical subregions: CT ST CWS SWS; Vic., Tas., S.A.
Distribution Sydney area: Bathurst–Orange.
Select locations: Mt Tayar (1964), Kandos, Bathurst, Lucknow.

Habitat

Habitat: Wet ground.
Altitude: 700–100 m **Annual rainfall:** above 600 mm
Typical local abundance: Frequent.
Vegetation: Grassland. Ground stratum.
Substrate: Basalt soil or stonework of old mine workings. Soil fertile. Watertable mostly high, moisture supply continuous, fresh.
Exposure:

Conservation

Conservation:

Erophila verna subsp. *verna* * BRASSICACEAE

Whitlow Grass

Life history

Growth form: Annual herb 3–20 cm high.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period:
Flowers: White or pink, August–October.
Fruit/seed: Capsule (silicula) 6–10 mm long,with numerous minute seeds, mature October.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S Europe.
Botanical subregions: CC SC NT CT ST CWS SWS; Vic., Tas., S.A.
Distribution Sydney area: Bathurst–Oberon.
Select locations: Wolgan Valley (1953), Bathurst, Hampton.

Habitat

Habitat: Seepage areas.
Altitude: 600–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Occasional.
Vegetation: Open-grassland. Ground stratum.
Substrate: Grey clay, fertile. Watertable mostly high, moisture supply continuous, fresh.
Exposure:

Conservation

Conservation:

Hirschfeldia incana * BRASSICACEAE

Hairy Brassica, Buchan Weed

Life history

Growth form: Herb to 1 m high.
Vegetative spread: No.
Longevity: Less than 5 years.
Primary juvenile period:
Flowers: Yellow, often purple-veined, all year.
Fruit/seed: Capsule 8–15 mm long, opening when ripe, February–May, 3–9 cells per cell. Seed reddish brown 1 mm diam.
Dispersal, establishment & growth: Diaspore: seed, winter-spring growing.
Fire response:
Interaction with other organisms: Seed eaten by Crimson Rosella *Platycercus elegans* (Lepschi 1993).

Distribution

Status/origin: Naturalised exotic, native to Mediterrranean.
Botanical subregions: CC SC NT CT ST NWS CWS SWS NWP SWP; S.A., Qld, Vic., Tas.
Distribution Sydney area: Western Sydney, Bathurst area.
Select locations: Mascot, Liverpool, Bents Basin, Camden, Campbelltown, Douglas Park, Picton, Bathurst (1903), Marrangaroo, Moss Vale.

Habitat

Habitat: Disturbed sites, embankments, along roads, railways and riverbanks.
Altitude: 0–1000 m **Annual rainfall:** 700–1200 mm
Typical local abundance: Occasional–rare.
Vegetation: Roadside herbaceous weeds, e.g. *Cirsium vulgare, Rumex, Senecio madagascariensis* also grassland.
Substrate: Sandy and stony soil, disturbed, infertile. Watertable permanently low, intermittent, fresh.
Exposure:

Conservation

Conservation: Weed of disturbed sites, not invasive of bushland.

Irenepharsus trypherus BRASSICACEAE

Life history

Growth form: Herb to 1 m high, spreading to erect.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, February–April.
Fruit/seed: Capsule (siliqua) 5–20 mm long, mature February. Seeds sticky when wet.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC.
Distribution Sydney area: Between Minnamurra Falls and Nowra area.
Select locations: Minnamurra Falls, Upper Kangaroo Valley, Barrengarry Creek.

Habitat

Habitat: Moist sheltered gullies. Moist rock walls of the gorge and gullies (Mills 1988).
Altitude: 0–600 m **Annual rainfall:** above 1200 mm
Typical local abundance: Rare to occasional.
Vegetation: Rainforest. Ground stratum.
Substrate: Rocky cliff face.
Exposure:

Conservation

Conservation: Endemic to Illawarra region, rare. Minnamurra Falls is northern limit, last collected 1959 (Mills 1988). Coded 2RC by Briggs & Leigh (1988).

Lepidium africanum * BRASSICACEAE

Life history

Growth form: Herb to 70 cm high.
Vegetative spread: No.
Longevity: Annual or perennial.
Primary juvenile period:
Flowers: Petals less than 0.8 mm long.
Fruit/seed: Dehiscent (silicula) 2–3 mm long, with small seeds, mature April–December.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Africa.
Botanical subregions: NC CC SC NT CT ST NWS CWS SWS NWP SWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Putty Road, Mt Colah, Cheltenham, Rockdale (1903), Mt Annan, Picton, Dapto, Albion Park, Orange, Hilltop.

Habitat

Habitat: Roadside, wasteland, regrowth woodland.
Altitude: 0–300 m **Annual rainfall:** above 800 mm
Typical local abundance: Frequent.
Vegetation: Roadside weeds, grassland, shrubland — *Olea europea* subsp. *africana*. Ground stratum.
Substrate: Clay soils from Wianamatta Shale, also disturbed sandstone sites. Soil fertile–infertile. Recorded on saline sites in western NSW (Semple 1993).
Exposure:

Conservation

Conservation: Common weed, not invasive of bushland.

Lepidium bonariense * BRASSICACEAE

Life history

Growth form: Herb to 50 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: White, March–December.
Fruit/seed: Capsule (silicula) 2–4 mm long, opening when ripe, at any time of year. Seeds 1.5 mm long.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to S America.
Botanical subregions: NC CC NT NWS CWS SWS NWP SWP NFWP; Qld, Vic.,S.A., W.A.
Distribution Sydney area: Widespread on coast and western Sydney.
Select locations: Swansea (1938), Cowan, Belrose (P. Kodela pers. comm.), Roseville, Centennial Park, Bankstown, Richmond, Austral, Campbelltown, Wollongong, Albion Park.

Habitat

Habitat: Roadside, wet places near creeks and salt water.
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: With grass, roadside weeds, fresh wetland and estuarine, e.g. *Casuarina glauca*. Ground stratum.
Substrate: Sand, sandstone boulders and muddy alluvium. Soil fertile–infertile–very infertile. Watertable mostly high, moisture supply intermittent, brackish–fresh. Recorded on saline sites in western NSW (Semple 1993).
Exposure: Mid shade.

Conservation

Conservation: A common weed, probably not invasive of bushland.

Lepidium campestre * BRASSICACEAE

Field Cress

Life history

Growth form: Herb to 60 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: White.
Fruit/seed: Capsule (silicula) 5–6 mm long.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: CC SC NT CT ST NWS; Vic., Tas.
Distribution Sydney area:
Select locations: Campbelltown (1903), Taralga (1914).

Habitat

Habitat:
Altitude: 0–900 m **Annual rainfall:** 700–800 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare weed.

Lepidium fasciculatum BRASSICACEAE

Life history

Growth form: Herb to 60 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period:
Flowers: Petals very small or absent, August–December.
Fruit/seed: Capsule (silicula) 3–4 mm long, opening when ripe, August–December. Seed 1.25 mm long.
Dispersal, establishment & growth: Diaspore: seed. A cool season annual, abundant only in occasional years (Cunningham et al. 1981).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC NT NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Coast, scattered, probably introduced by stock.
Select locations: Wondabyne (1922), Flemington Saleyards.

Habitat

Habitat: Saleyards ?
Altitude: 0–100 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: An inland species; occurrences near Sydney would certainly be casual introductions along rail or road (L. Johnson pers. comm.).

Lepidium hyssopifolium BRASSICACEAE

Peppercress

Life history

Growth form: Herb to 50 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: Petals very small or absent, February.
Fruit/seed: Capsule (silicula) 3–5 mm long, opening when ripe, February. Seed 1.5 mm long.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms: Foodplant of Black Swan *Cygnus atratus* (Barker & Vestjens 1989,1990).

Distribution

Status/origin: Native.
Botanical subregions: NT CT ?ST; Qld, Vic., Tas., S.A., N.Z.
Distribution Sydney area: Bathurst–Carcoar.
Select locations: Bathurst, Peelwood.

Habitat

Habitat:
Altitude: 700 m **Annual rainfall:** 600–700 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Rare, coded 3ECa+ by Briggs & Leigh (1988), but not conserved in Sydney area.

Lepidium peregrinum BRASSICACEAE

Life history

Growth form: Herb to 40 cm high.
Vegetative spread:
Longevity: 1 year.
Primary juvenile period:
Flowers:
Fruit/seed: Capsule (silicula) 2.7 mm long.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NT CT.
Distribution Sydney area: Blue Mountains.
Select locations: No locations known.

Habitat

Habitat:
Altitude: **Annual rainfall:**
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Regarded as extinct, probably due to heavy grazing, and coded 3X by Briggs & Leigh (1988).

Lepidium perfoliatum * BRASSICACEAE

Life history

Growth form: Herb 20–40 cm high.
Vegetative spread: No.
Longevity: Less than 5 years.
Primary juvenile period:
Flowers: Yellow.
Fruit/seed: Capsule (silicula) 3–4 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe.
Botanical subregions: CT ST; Qld, S.A.
Distribution Sydney area: Campbelltown.
Select locations: Campbelltown district (1903) only record for Sydney area.

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** 750 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Not naturalised in the Sydney area.

Lepidium pseudohyssopifolium BRASSICACEAE

Peppercress

Life history

Growth form: Herb to 60 cm high.
Vegetative spread:
Longevity: Annual or perennial.
Primary juvenile period:
Flowers: Petals very small or absent.
Fruit/seed: Capsule (silicula) 3 mm long, mature, February and July.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC ST CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., S.A., W.A., N.Z.
Distribution Sydney area: Illawarra coast.
Select locations: Five Islands, Shellharbour, Kiama.

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Rare, last specimen collected Shellharbour (1949), conservation status not known.

Lepidium pseudotasmanicum BRASSICACEAE

Life history

Growth form: Herb 20–40 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers:
Fruit/seed: Dehiscent (silicula) 3 mm long, mature, January.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: CC SC; Qld, Vic., Tas., W.A., N.Z.
Distribution Sydney area: Coast.
Select locations: Como, Emu Plains, Otford.

Habitat

Habitat:
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance:
Vegetation:
Substrate:
Exposure:

Conservation

Conservation: Rare, last recorded Emu Plains (1915), conservation status not known.

Lobularia maritima * BRASSICACEAE

Sweet Alyssum

Life history

Growth form: Herb 5–40 cm high.
Vegetative spread:
Longevity: Perennial.
Primary juvenile period:
Flowers: White, pink or purple, at any time of year.
Fruit/seed: Capsule (silicula) 2–3 mm wide, 1-seeded, mature March–June.
Dispersal, establishment & growth:
Fire response: Probably killed, flowering within 23 weeks of high-intensity fire 1/1994 at Lane Cove (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean. Introduced as garden plant.
Botanical subregions: CC SC CT; Qld, Vic., S.A., W.A.
Distribution Sydney area: Mainly coastal.
Select locations: Paddington, Tamarama, Ashfield (1887), Little Bay, Wollongong, Albion Park, Kiama, Minnamurra River, Leura.

Habitat

Habitat: Grassy area generally near sea. Found on old homestead site at Leura after fire.
Altitude: 0–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Grassy areas. Ground stratum.
Substrate: Beach, roadsides, remnant gardens, sandy soils.
Exposure:

Conservation

Conservation: Garden escape, not invasive of bushland.

Lunaria annua * BRASSICACEAE

Honesty

Life history

Growth form: Herb 50–100 cm high.
Vegetative spread: No.
Longevity: 2 years.
Primary juvenile period:
Flowers: Bluish purple, September.
Fruit/seed: Capsule (silicula) circular, 30–40 mm long, with seeds 7 mm diam.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe. Introduced as ornamental, rarely naturalised.
Botanical subregions: NT CT ST SWS; Vic.
Distribution Sydney area: Oberon.
Select locations: Oberon (1936).

Habitat

Habitat:
Altitude: 1100 m **Annual rainfall:** 850 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Widely cultivated as an ornamental, especially for dried arrangements of the silvery septa ot the fruit, very rarely naturalised.

Raphanus raphanistrum *

BRASSICACEAE

Wild Radish, Jointed Charlock

Life history

Growth form: Slender herb 15–50 cm high, much branched, with long rosette leaves, taproot wiry to stout but not fleshy.
Vegetative spread: No.
Longevity: Generally 1 year.
Primary juvenile period: 3–6 months.
Flowers: White or yellow, at any time. Insect-pollinated, syrphids and white butterflies showed strong preference for yellow flowers (Armstrong et al. 1982).
Fruit/seed: Indehiscent pod (siliqua) 1–5 cm long, breaking into one-seeded capsules during harvest, mature October–November. Seeds ovoid 1.5–4 mm long. Can produce up to 17 000 seeds per square metre (Dellow 1987).

Dispersal, establishment & growth: Diaspore: 1-seeded capsule. Dispersed by wind, water, animals and humans in mud, but principally through agriculture (Parsons & Cuthbertson 1992), mixed with cereal grain (Dellow 1987). Germination of above 1000 seeds per square metre recorded, throughout year, over a wide range of temperatures but germinates best with widely fluctuating temperatures (Dellow 1987). Emergence is greatly increased by cultivation, the buried seed stimulated by darkness and higher moisture. Soil-stored seedbank, 20–40% of seeds produced in any one year remain viable in the soil after 12 months (Dellow 1987), buried seed remains viable longer, some remain viable for up to 20 years (Parsons & Cuthbertson 1992). Generally a winter and spring-growing annual but with suitable conditions can grow and mature throughout the year (Dellow 1987).
Fire response:
Interaction with other organisms: Host to thrips, flea beetles, and other plant pests and diseases; can cause death of cattle and lambs (Parsons & Cuthbertson 1992).

Distribution

Status/origin: Naturalised exotic, native to Europe. Reported naturalised in Sydney by 1867 (Parsons & Cuthbertson 1992).
Botanical subregions: NC CC NT CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Wondabyne, Terrey Hills, Royal Botanic Gardens (1902), Glenfield, Elderslie, Campbelltown, Shellharbour, Robertson (P. Kodela pers. comm.).

Habitat

Habitat: Margins of cultivated areas, roadsides, winter cereal crops; pastures (P. Kodela pers. comm.).
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Weeds of waste areas. Ground stratum.
Substrate: Sandy–clay soils, basalt (P. Kodela pers. comm.). Principally on highly fertile, acid, nitrogenous soils (Parsons & Cuthbertson 1992).
Exposure: Full sun.

Conservation

Conservation: Major weed of winter cereal crops reducing crop yields, probably not invasive of bushland.

Raphanus sativus *

BRASSICACEAE

Radish

Life history

Growth form: Herb 20–100 cm high, with fleshy edible taproot.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period: Less than 1 year.
Flowers: White–purple, October–November.
Fruit/seed: Capsule (siliqua) 2–6 cm long, not breaking into 1-seeded units at maturity like *R. raphanistrum*, mature October–November.

Dispersal, establishment & growth: Diaspore: seed, dispersed by humans; germinates readily in cultivation, within 7 days.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to Europe. Introduced as crop plant and cultivated for its edible taproot, doubtfully naturalised.
Botanical subregions: CC CWS;Qld, Vic., Tas., S.A.
Distribution Sydney area:
Select locations: Cheltenham, Dundas, North Sydney (1916), Richmond (1916).

Habitat

Habitat: Self-sown in garden.
Altitude: 0–100 m **Annual rainfall:** above 700 mm
Typical local abundance: Rare.
Vegetation: Ground stratum.
Substrate: Garden soil.
Exposure:

Conservation

Conservation: Self-sown in gardens and wasteland, unlikely to persist.

Rapistrum rugosum * BRASSICACEAE

Turnip Weed, Giant Mustard

Life history

Growth form: Herb 15–60 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow, dark-veined, April–November.
Fruit/seed: Capsule (silicula) 5–10 mm long, breaking into upper segment 3–6 mm long with 1 large seed, and lower segment 3 mm long with 0–2 small seeds, mature November.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC NT CT NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas.
Distribution Sydney area: Western Sydney.
Select locations: Liverpool (1964), Glenfield, Menangle, Razorback, Meadow Flat Creek.

Habitat

Habitat: Roadside and earthworks.
Altitude: 0–800 m **Annual rainfall:** 600–900 mm
Typical local abundance: Frequent.
Vegetation: With other wasteland weeds. Ground stratum.
Substrate: Clay soils from Wianamatta Shale, fertile. Watertable permanently low, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation:

Rorippa dictyosperma BRASSICACEAE

Life history

Growth form: Herb 30–90 cm high.
Vegetative spread: Probably not.
Longevity: Perennial.

Primary juvenile period:
Flowers: White.
Fruit/seed: Capsule (siliqua) 25–60 mm long, mature January–February. Seeds not mucilaginous when wet.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CT ST; Qld, Vic., Tas., W.A.
Distribution Sydney area: Upper Blue Mountains.
Select locations: Mt Wilson, Jenolan Caves (1900), Barbers Creek.

Habitat

Habitat: Edge of track.
Altitude: 800–1000 m **Annual rainfall:** above 1000 mm
Typical local abundance: Rare.
Vegetation: Rainforest. Ground stratum.
Substrate: Probably basalt soil, fertile. Fertile soil, but not always basalt (L. Johnson pers. comm.). Watertable mostly high, moisture supply intermittent, fresh.
Exposure:

Conservation

Conservation: Conservation status unknown.

Rorippa gigantea BRASSICACEAE

Life history

Growth form: Decumbent to erect herb to 120 cm high with sessile leaves.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: White, September–January.
Fruit/seed: Capsule (siliqua) 15–40 mm long, mature December–February. Seeds sticky.
Dispersal, establishment & growth: Diaspore: seed, probably animal/bird-dispersed. Seedling recruitment after disturbance, possibly fire related.
Fire response: Probably killed.
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT CT ST; Qld, Vic., Tas., N.Z.
Distribution Sydney area: Widespread but localised.
Select locations: Culoul Range, Blacksmiths Creek, Mt Warrawolong, Patonga, Waterfall, Cataract Creek, Cambewarra, Blackheath, Bundanoon.

Habitat

Habitat: Edge of creeks, tracks, hillsides, disturbed sites.
Altitude: 0–700 m **Annual rainfall:** above 1000 mm
Typical local abundance: Frequent.
Vegetation: Edge of rainforest, e.g. found with *Solanum* spp. Ground stratum.
Substrate: Moist sandy alluvial soils, possibly with clay influence, fertile. Not on the usual highly infertile sandstone soils (L. Johnson pers. comm.).
Exposure: Sheltered situations, light shade–full sun.

Conservation

Conservation: Conservation status unknown.

Rorippa laciniata BRASSICACEAE

Life history

Growth form: Herb to 40 cm high.
Vegetative spread: Probably not.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, August–March.
Fruit/seed: Capsule (siliqua) 15–40 mm long, opening when ripe, October–April. Seeds brown.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native.
Botanical subregions: NC CC SC NT ST NWS CWS SWS NWP SWP; Qld, Vic., S.A.
Distribution Sydney area: Sydney and South Coast.
Select locations: Cowan, Cheltenham, Cooks River, Austral, Mt Kembla, Whispering Gallery (Albion Park), Minnamurra Falls, Cambewarra.

Habitat

Habitat: Rocky creeks.
Altitude: 0–500 m **Annual rainfall:** above 800 mm
Typical local abundance: Rare.
Vegetation: Light break in rainforest, open-forest. Ground stratum.
Substrate: Sandstone, shale derived soil, fertile–infertile. Watertable mostly high, moisture supply intermittent, fresh.
Exposure: Sheltered situations; light shade.

Conservation

Conservation: Rare, probably not well conserved. Vulnerable in Western Sydney (Benson & McDougall 1991).

Rorippa microphylla * BRASSICACEAE

One-rowed Watercress

Life history

Growth form: Decumbent aquatic or semi-aquatic, stems to 40 cm long.
Vegetative spread: Stoloniferous.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, November–January.
Fruit/seed: Capsule (siliqua) 15–30 mm long.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, W Asia.
Botanical subregions: CC NT CT ST; Vic., Tas., S.A.
Distribution Sydney area: Sporadic.
Select locations: Kiama (1955), Oberon (1955), Taralga, Berrima.

Habitat

Habitat: Creekbed.
Altitude: 500–1000 m **Annual rainfall:** above 800 mm
Typical local abundance: Occasional–rare.
Vegetation:
Substrate: Mud or shallow water. Watertable permanently high, moisture supply continuous, fresh.
Exposure:

Conservation

Conservation:

Rorippa nasturtium-aquaticum * BRASSICACEAE

Watercress

Life history

Growth form: Decumbent aquatic or semi-aquatic herb, stems hollow, to 60 cm long.
Vegetative spread: Stoloniferous, stems root at nodes and spread.
Longevity: Perennial.
Primary juvenile period:
Flowers: White, November.
Fruit/seed: Capsule (siliqua) 10–18 mm long, mature November–February.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms: Eaten by humans but may contain toxins if growing on edges of polluted waterways (e.g. pesticides and fertilisers) (P. Kodela pers. comm.).

Distribution

Status/origin: Naturalised exotic, native to W Asia, Europe, N Africa. Cultivated for edible leaves.
Botanical subregions: NC CC NT CT ST NWS CWS; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Sydney suburban areas and Western Blue Mountains. Southern Highlands (P. Kodela pers. comm.).
Select locations: Cheltenham, Bondi, Kogarah, Menangle Park, Glenquarry, Wombeyan Caves, Abercrombie Caves, Tuena Creek (1918).

Habitat

Habitat: Creek banks and in slow-moving water.
Altitude: 0–800 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent–occasional.
Vegetation: Wetland vegetation.
Substrate: Sandy alluvium, infertile. Watertable permanently high, moisture supply continuous, fresh. Margins of Wingecarribee swamp in fertile conditions (P. Kodela pers. comm.). Recorded on saline sites in western NSW (Semple 1993).
Exposure: Sheltered situations.

Conservation

Conservation: Weed in some urban bushland creeks.

Rorippa palustris * BRASSICACEAE

Yellow Cress, Marsh Watercress

Life history

Growth form: Herb 20–100 cm high.
Vegetative spread: Sometimes stoloniferous.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow, December–January.
Fruit/seed: Capsule (siliqua) 5–9 mm long, mature December–March, peak December.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC CT ST NWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Widespread.
Select locations: Broadwater Swamp, Windsor, Shane Park, Nepean River (Menangle), Jenolan Caves (1899), Kowmung River, Macquarie River, Fitzroy Falls Reservoir (P. Kodela pers. comm.).

Habitat

Habitat: River banks and in water.
Altitude: 0–1000 m **Annual rainfall:** above 600 mm
Typical local abundance: Frequent–occasional.
Vegetation: Wetland and creekbank vegetation, e.g. with *Persicaria, Ranunculus, Juncus, Lythrum.*

Substrate: Water or wet sand, fertile–infertile. Watertable permanently high, moisture supply continuous, fresh.
Exposure: Sheltered situations.

Conservation

Conservation:

Sinapis alba * BRASSICACEAE

White Mustard

Life history

Growth form: Herb, stems 30–80 cm high.
Vegetative spread: No.
Longevity: 1 year.
Primary juvenile period: Less than 1 year.
Flowers: Yellow, February.
Fruit/seed: Capsule (siliqua) 20–40 mm long, mature February. Seeds spherical, 1.7–2.3 mm diam., 1–4 per cell, pungent-tasting.
Dispersal, establishment & growth:
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Mediterranean and & W Asia. Introduced to Australia as a cultivated crop for its pungent-tasting seeds.
Botanical subregions: CC ST CWS SWP; Qld, Tas.
Distribution Sydney area: Razorback.
Select locations: Razorback (1968).

Habitat

Habitat: Roadmaking earthworks.
Altitude: 300 m **Annual rainfall:** 700 mm
Typical local abundance: Rare.
Vegetation:
Substrate: Roadmaking earthworks, clay soil, fertile.
Exposure:

Conservation

Conservation: Rare weed of cultivation.

Sinapis arvensis * BRASSICACEAE

Charlock

Life history

Growth form: Herb 30–80 cm high, stems often purplish.
Vegetative spread: No.
Longevity: Annual.
Primary juvenile period:
Flowers: Yellow, September.
Fruit/seed: Capsule (siliqua) 20–60 mm long, opening when ripe. Seeds globular, 1–2 mm diam., 6–12 per cell.
Dispersal, establishment & growth: Diaspore: seed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe, Asia and N Africa.
Botanical subregions: NC CC NWS CWS SWS NWP SWP SFWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area: Glenfield.
Select locations: Glenfield (1954) only record.

Habitat

Habitat: Isolated patch in oat crop.
Altitude: 30 m **Annual rainfall:** 800 mm

Typical local abundance: Rare.
Vegetation: Patch in oat crop.
Substrate: Probably clay soils, fertile.
Exposure: No shade.

Conservation

Conservation: Occurs in more inland regions, accidental introductions near Sydney.

Sisymbrium irio BRASSICACEAE

London Rocket

Life history

Growth form: Herb 25–60 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow–pale yellow, August–September.
Fruit/seed: Capsule (siliqua) 2.5–6.5 cm long, opening when ripe. Seeds ovoid, 1 mm diam., about 40 per cell.
Dispersal, establishment & growth: Dispore: seed, winter–spring-growing.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Native NSW species, possibly introduced from western NSW by stock, first recorded 1963.
Botanical subregions: NC CC NWS CWS SWS NWP SWP NFWP SFWP; all mainland States, Europe.
Distribution Sydney area: Flemington Saleyards, sporadic.
Select locations: Narara Creek, Glenfield (1963), Narellan.

Habitat

Habitat: Rubbish tip, saleyards, very disturbed sites.
Altitude: 0–200 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: With *Alternanthera philoxeroides*, for example. Ground stratum.
Substrate: Watertable mostly high.
Exposure:

Conservation

Conservation: Occasionally apparently naturalised in very disturbed places.

Sisymbrium officinale * BRASSICACEAE

Hedge Mustard

Life history

Growth form: Herb to 90 cm high.
Vegetative spread: No.
Longevity: Less than 5 years.
Primary juvenile period:
Flowers: Yellow–pale yellow. October–November.
Fruit/seed: Capsule (siliqua) 1–2 cm long, opening when ripe, mature December. Seeds ellipsoid–ovoid, 1.5 mm long.
Dispersal, establishment & growth: Diaspore: seed, autumn–winter-growing weed.
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NC CC SC NT CT ST NWS CWS NWP SWP; Qld, Vic., Tas., S.A., W.A.
Distribution Sydney area:

Select locations: Epping, Flemington, Campbelltown, Picton, Jenolan Caves (1899), Mt Cameron, Orange, East Kangaloon (P. Kodela pers. comm.).

Habitat

Habitat: Various — disturbed sites, rubbish tips, pastures, moist forest.
Altitude: 0–1000 m **Annual rainfall:** above 700 mm
Typical local abundance: Frequent.
Vegetation: Moist eucalypt forest, e.g. *Eucalyptus viminalis–E. radiata*. Ground stratum.
Substrate: Basalt, shale soils, fertile.
Exposure:

Conservation

Conservation: Widespread occasional weed; not in bushland except where severely disturbed (L. Johnson pers. comm.).

Sisymbrium orientale * BRASSICACEAE

Indian Hedge Mustard

Life history

Growth form: Herb 25–90 cm high.
Vegetative spread: No.
Longevity: 1–2 years.
Primary juvenile period:
Flowers: Yellow–pale yellow at any time, peak October.
Fruit/seed: Capsule (siliqua) 4–10 cm long, opening when ripe, mature January. Seed ovoid, 1 mm long, about 60 per cell.
Dispersal, establishment & growth: Diaspore: seed; an autumn–spring weed, prevalent in years of high winter–spring rainfall (Cunningham et al. 1981).
Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to W Asia, Mediterranean.
Botanical subregions: NC CC SC CT ST NWS CWS SWS NWP SWP NFWP SFWP; Qld, Vic., Tas., N.T., S.A., W.A.
Distribution Sydney area: Western Sydney, Bathurst. Southern Highlands (P. Kodela pers. comm.).
Select locations: Wondabyne, Royal Botanic Gardens (1902), Flemington Saleyards, Glenfield, Camden, Picton, Shellharbour, Bathurst, Meadow Flat, Moss Vale.

Habitat

Habitat: Stock pens, roadside, rubbish tip.
Altitude: 0–800 m **Annual rainfall:** above 600 mm
Typical local abundance: Occasional.
Vegetation: Ground stratum, e.g. with pasture grasses and other herbs.
Substrate: Disturbed sites. Fertile soil.
Exposure:

Conservation

Conservation: Weed of disturbed soil, not invasive of bushland.

Turritis glabra * BRASSICACEAE

Tower Mustard

Life history

Growth form: Biennial herb 60–120 cm high.
Vegetative spread:
Longevity: 2 years.
Primary juvenile period:
Flowers: Pale yellow, October.
Fruit/seed: Capsule (siliqua) 3–7 cm long.
Dispersal, establishment & growth: Diaspore: seeds.

Fire response:
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Europe.
Botanical subregions: NT CT ST; Vic.
Distribution Sydney area: Jenolan Caves.
Select locations: Jenolan Caves (1899), only record for Sydney area.

Habitat

Habitat:
Altitude: 1000 m **Annual rainfall:** 900 mm
Typical local abundance:
Vegetation: Ground stratum.
Substrate:
Exposure:

Conservation

Conservation: Rarely naturalised.

Buddleja davidii * BUDDLEJACEAE

Butterfly Bush

Life history

Growth form: Shrub 1.5–3 m high.
Vegetative spread: No.
Longevity: 10–20 years.
Primary juvenile period: 2 years.
Flowers: White to lilac-purple, May–October, probably butterfly-pollinated.
Fruit/seed: Brownish capsule 5-10 mm long, 2-valved with many seeds.
Dispersal, establishment & growth: Diaspore: seed, wind-dispersed locally, establishes in moist rocky crevices. Possibly also water-dispersed (Carr et al. 1992).
Fire response: Possibly killed after high-intensity fire (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Exotic, native to China and Japan, introduced as ornamental. Widely cultivated, persists in old gardens, naturalised in Blue Mountains.
Botanical subregions: NT CT ST.
Distribution Sydney area: Upper Blue Mountains.
Select locations: Lithgow (1979), also Katoomba, Leura (1993).

Habitat

Habitat: Naturalised on cliffs, railway cuttings, disturbed sites.
Altitude: 0–1000 m **Annual rainfall:** above 1200 mm
Typical local abundance: Frequent.
Vegetation: Eucalypt open-forest, e.g. *Eucalyptus radiata*, *E. cypellocarpa*.
Substrate: Cliffs and cuttings, sandstone, infertile soil. Watertable mostly high, moisture supply intermittent, fresh.
Exposure: Full sun–mid shade.

Conservation

Conservation: Naturalised in upper Blue Mountains, possibly increasing in abundance, potential problem in urban bushland and bushland margins.

Buddleja madagascariensis * (Nicodemia madagascariensis) BUDDLEJACEAE

Butterfly Bush

Life history

Growth form: Straggly shrub 1.5–4 m high.
Vegetative spread: Vegetative (anon 1991).
Longevity:
Primary juvenile period:
Flowers: Orange, May–October.

Fruit/seed: Globose berry, 5 mm long, blue-violet, with many seeds.
Dispersal, establishment & growth: Diaspore: berry, dispersal of fruit not known. Vegetative fragments dispersed in garden refuse or dispersed by gravity or water (Anon 1991).
Fire response: Resprouted from base after high-intensity fire 1/1994 at Narrabeen (P. Kubiak pers. comm.).
Interaction with other organisms:

Distribution

Status/origin: Naturalised exotic, native to Madagascar. Introduced as an ornamental, widely cultivated, persisting in old gardens, more or less naturalised in a few disturbed areas.
Botanical subregions: NC CC SC.
Distribution Sydney area: Sydney suburbs.
Select locations: Wisemans Ferry, Cheltenham, Narrabeen, Ermington, Nowra (1920).

Habitat

Habitat: Disturbed sites in moist forest, urban bush.
Altitude: 0–200 m **Annual rainfall:** above 750 mm
Typical local abundance: Occasional.
Vegetation: Moist eucalypt forest, e.g. with *Syncarpia glomulifera, Angophora costata, Eucalyptus pilularis.*
Substrate: Shale, laterite soils, fertile, watertable mostly high.
Exposure: Full sun.

Conservation

Conservation: Minor weed.

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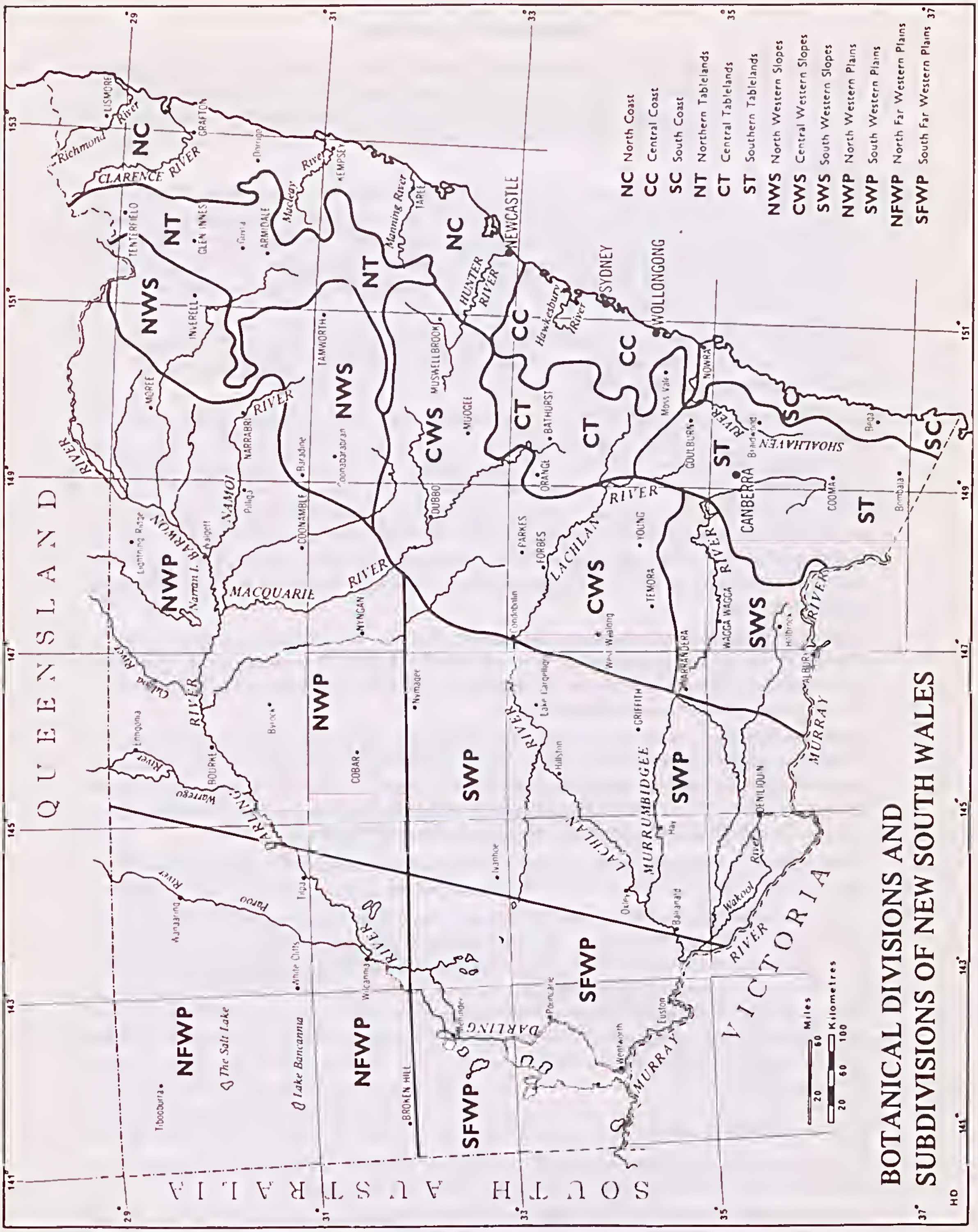

For explanation and description of the Botanical Divisions and Subdivisions of New South Wales see Anderson, R. H. (1961). Introduction. *Contr. New South Wales Natl. Herb. Fl. New South Wales* Nos 1–18, pp. 1–15.

Information for authors

Cunninghamia is published twice a year. General aspects of plant ecology are covered in the July issue. The December issue is devoted mainly to the *Ecology of Sydney Plant Species*. Papers dealing with all aspects of plant ecology, in particular vegetation mapping and plant community dynamics, will be considered for publication. Papers dealing primarily with New South Wales will be given preference.

The deadline for submission of papers for the July issue is 1 October. All papers will be refereed. Two copies of the manuscript should be submitted along with originals of photographs and clear photocopies of all other figures. Once a paper has been accepted for publication the author should provide the paper on a computer disk along with the final artwork for figures etc. The disk should be Macintosh format or IBM compatible (MS-DOS), and clearly labelled with the file name(s) and word-processing program used.

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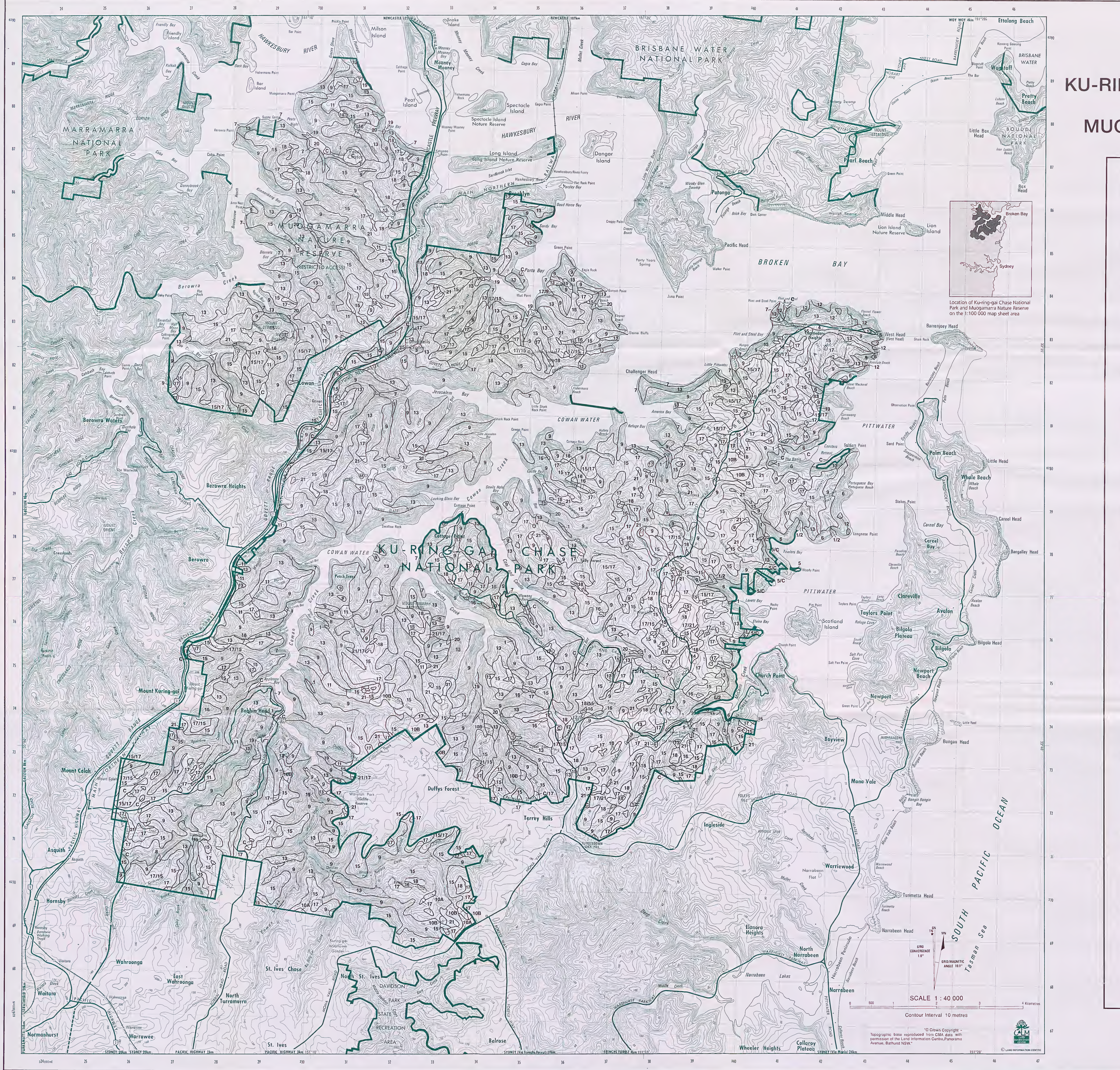
Tables should preferably be portrait rather than landscape shape i.e. tall and not wide. They should be typed as separate files. Column headings should be brief with units of measurement in parentheses. Each table must be referred to in the text and its approximate position should be indicated in the manuscript.

VEGETATION
OF
KU-RING-GAI CHASE NATIONAL PARK
AND
MUOGAMARRA NATURE RESERVE



Location of Ku-ring-gai Chase National Park and Muogamarra Nature Reserve on the 1:100 000 map sheet area

SCALE 1 : 40 000

0 500 1 2 3 4 Kilometres

Contour Interval 10 metres

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Plant communities in Ku-ring-gai Chase National Park and Muogamarra Nature Reserve

Summarised descriptions give map code, structure, habitat, geology and dominant species based on Thomas and Benson, 1985, *Vegetation survey of Ku-ring-gai Chase National Park* (Royal Botanic Gardens Sydney). Code in brackets at end shows relevant map unit for Sydney 1:100 000 map sheet.

1 **Closed-forest**
Tristaniopsis laurina, Ceratopetalum apetalum

Gully Rainforest in sheltered gullies close to sea level, Hawkesbury Sandstone soils **(10ag)**.

2 **Low closed-forest/closed-forest with emergent trees**
Acmena smithii, Glochidion ferdinandi, Livistona australis, emergents — *Eucalyptus botryoides, Angophora floribunda*

Rainforest with emergent eucalypts. Sheltered slopes, mostly western Pittwater, Narrabeen Group soils **(9h)**.

3 **Tall open-forest/open-forest**
Eucalyptus agglomerata, Angophora floribunda, Allocasuarina torulosa

Confined to breccia in Campbells Crater **(6c)**.

4 **Open-forest**
Eucalyptus paniculata, Eucalyptus umbra, Eucalyptus scias, Syncarpia glomulifera, Angophora floribunda

Clay soils from weathered volcanic dyke at West Head **(6c)**.

5 **Open-forest**
Eucalyptus maculata, Eucalyptus paniculata, Syncarpia glomulifera, Allocasuarina torulosa

Western Pittwater, on Narrabeen Group shales **(9g)**.

6 **Open-forest**
Angophora floribunda, Eucalyptus paniculata, Eucalyptus botryoides, Eucalyptus scias, Syncarpia glomulifera, Allocasuarina torulosa

Sheltered slopes, western Pittwater, Narrabeen Group shales and sandstones **(9h)**.

7 **Open-forest**
Angophora floribunda, Eucalyptus punctata, Allocasuarina torulosa

Footslopes above saltwater estuaries and foreshores of Cowan Creek, Coal and Candle Creek, Smiths Creek and Hawkesbury River. Mostly Narrabeen Group **(9h)**.

8 **Open-forest**
Eucalyptus pilularis, Eucalyptus resinifera, Angophora costata, Syncarpia glomulifera

Upper Cockle Creek valley on Wianamatta Shale soils **(9o)**.

9 **Open-forest**
Eucalyptus piperita, Angophora costata, Eucalyptus gummifera, Eucalyptus umbra, Syncarpia glomulifera

Sheltered aspects on slopes, particularly steep south-facing slopes, Hawkesbury Sandstone soils including podzols **(10ag)**.

10A **Open-forest**
Eucalyptus capitellata, Eucalyptus gummifera, Eucalyptus sieberi, Eucalyptus haemastoma

Along Mona Vale Road on 'lateritic' soils from shale lenses now exposed as cappings on plateaus over Hawkesbury Sandstone **(9sf)**.

10B **Open-forest/low open-forest**
Eucalyptus sieberi, Eucalyptus gummifera, Eucalyptus sparsifolia, Eucalyptus haemastoma

At Duffys Forest on 'lateritic' soils from shale lenses now exposed as cappings on plateaus over Hawkesbury Sandstone **(9sf)**.

11 **Low open-forest**
Eucalyptus racemosa, Eucalyptus gummifera, Eucalyptus sparsifolia, Eucalyptus sieberi

On flat ridgetops e.g. Windybanks Ridge, on Hawkesbury Sandstone with yellow-earth soils, clay sub-soils and ironstone fragments **(10ar)**.

12 **Low open-forest with patches of Grassland**
Allocasuarina torulosa, Allocasuarina littoralis, Banksia integrifolia, emergent trees — *Angophora costata, Eucalyptus botryoides*

Exposed sites on headlands with clay soils from the Narrabeen Group **(21a)**.

13 **Woodland**
Angophora costata, Eucalyptus gummifera, Eucalyptus umbra, Allocasuarina littoralis and (west of Cowan Creek) *Eucalyptus eximia*

Moderate to steep slopes, exposed aspects on Hawkesbury Sandstone **(10ar)**.

14 **Low woodland**
Eucalyptus camfieldii, Eucalyptus haemastoma, Eucalyptus gummifera

Clay soil with ironstone fragments on Hawkesbury Sandstone. Very restricted, West Head Road/Elvina Bay Track **(10ar)**.

15 **Low woodland/low open-woodland**
Eucalyptus gummifera, Eucalyptus haemastoma, Eucalyptus sparsifolia, Eucalyptus eximia (west of Cowan Creek), *Angophora bakeri* (in Muogamarra Nature Reserve).

Low slope plateau areas — crests, spurs and upper slopes on Hawkesbury Sandstone **(10ar)**.

16 **Low open-woodland (mallee)**
Eucalyptus luehmanniana

Seepage zones on upper slopes with southerly aspects on Hawkesbury Sandstone. Uncommon **(10ar)**.

17 **Closed scrub/scrub-heath**
Banksia ericifolia, Hakea teretifolia, Allocasuarina distyla, Leptospermum trinervium, Angophora hispida, emergents — *Eucalyptus haemastoma, Eucalyptus gummifera*

Poorly-drained areas on the plateaus, low slope areas on ridges, hillsides and sandstone benches and thin skeletal soils on ridgetops. Hawkesbury Sandstone **(21g)**.

18 **Pockets of Heath on rocky outcrops**
Baeckea brevifolia, Baeckea diosmifolia, Kunzea capitata, Calytrix tetragona, Darwinia fascicularis subsp. *fascicularis, Allocasuarina distyla*

Exposed rock platforms with shallow depressions, Hawkesbury Sandstone **(21g)**.

19 **Tall open-scrub**
Avicennia marina, Aegiceras corniculatum

Mangroves along tidal watercourses and mud flats. Mainly limited to Upper Cowan Creek, Smiths Creek, Cockle Creek and Porto Bay, Kimmerakong Bay, Joe Crafts Bay and Peats Bight **(4a)**.

20 **Reedland/rushland and *Casuarina* Woodland**
Juncus kraussii, Phragmites australis, Sarcocornia quinqueflora, Baumea juncea, Sporobolus virginicus, Casuarina glauca

Alluvial flats associated with tidal creeks, on landward side of Mangroves (Community 19) **(4a)**.

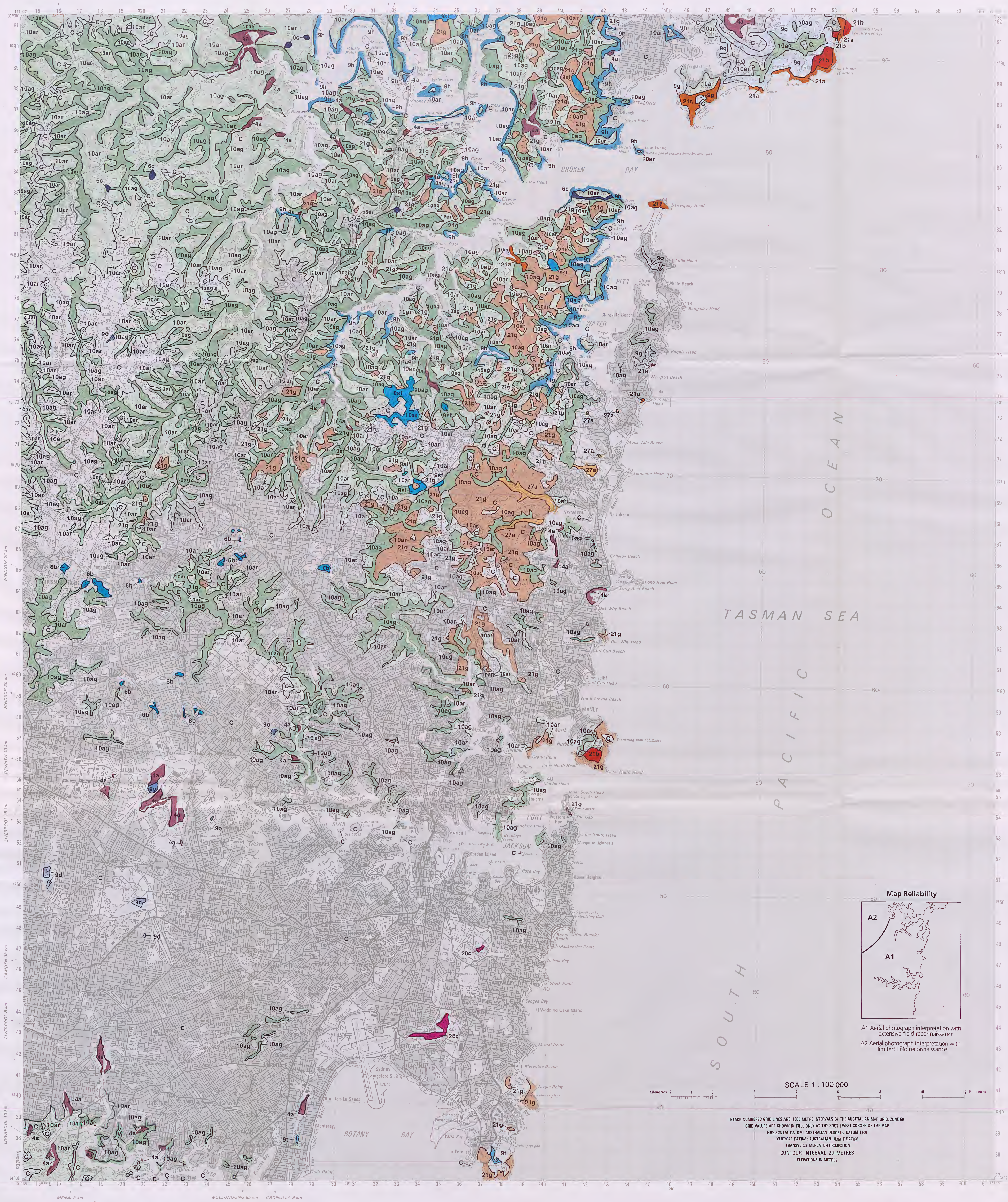
21 **Sedgeland/shrubland**
Gahnia sieberiana, Empodisma minus, Leptocarpus tenax, Schoenus brevifolius, Gymnoschoenus sphaerocephalus, Xyris operculata, shrubs — *Banksia robur, Sprengelia incarnata, Viminaria juncea, Callistemon citrinus*

Areas of impeded drainage with a consistently high watertable, Hawkesbury Sandstone **(21g)**.

C **Cleared or disturbed areas**

SYDNEY

1:100 000 VEGETATION SERIES



Map Reliability

A1 Aerial photograph interpretation with extensive field reconnaissance

A2 Aerial photograph interpretation with limited field reconnaissance

SCALE 1 : 100 000

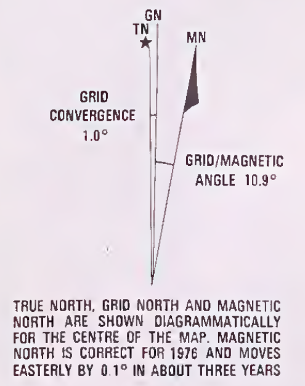
BLACK NUMBERED GRID LINES ARE 1000 METRE INTERVALS OF THE AUSTRALIAN MAP GRID, ZONE 56
GRID VALUES ARE SHOWN IN FULL ONLY AT THE SOUTH WEST CORNER OF THE MAP
HORIZONTAL DATUM: AUSTRALIAN GEODETIC DATUM 1966
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
TRANSVERSE MERCATOR PROJECTION
CONTOUR INTERVAL 20 METRES
ELEVATIONS IN METRES

MAP UNIT DESCRIPTION

	MAP UNIT	STRUCTURE	MAIN CANOPY SPECIES	GEOLOGY	OCCURRENCE
🟪	4a	**Estuarine Complex** Open-scrub	*Avicennia marina* *Aegiceras corniculatum*	Holocene alluvium	Estuarine mudflats, regular tidal inundation
		Herbland	*Sarcocornia quinqueflora* *Suaeda australis*	"	Occasional tidal inundation
		Rushland	*Juncus kraussii* *Phragmites australis*	"	Infrequent tidal inundation; brackish water
		Low open-forest	*Casuarina glauca* *Baumea juncea*	"	Poorly-drained, some saline influence
🟦	6b	**Blue Gum High Forest** Tall open-forest/ open-forest	*Eucalyptus pilularis* *Eucalyptus saligna*	Wianamatta Shale	Broad ridges with residual shale soils North Shore to Hornsby
🟪	6c	**Glen Forest** Tall open-forest	*Eucalyptus saligna*	Diatremes	Isolated valleys
		Tall open-forest	*Eucalyptus agglomerata* *Angophora floribunda*	"	"
🟦	9d	**Transition Forest** Open-forest	*Eucalyptus fibrosa* *Eucalyptus moluccana* *Melaleuca decora*	Wianamatta Shale	Auburn
⬜	9g	**Spotted Gum – Blackbutt Forest** Open-forest	*Eucalyptus gummifera* *Eucalyptus maculata* *Eucalyptus pilularis*	Narrabeen Group	Bouddi Peninsula
		Open-forest	*Eucalyptus maculata* *Eucalyptus paniculata*	"	Lower hillslopes, Warringah Peninsula
		Woodland	*Eucalyptus umbra* *Eucalyptus paniculata*	"	Exposed slopes, Bouddi Peninsula
		Open-forest	*Archontophoenix cunninghamiana*	"	Deep gullies, Bouddi Peninsula
🟦	9h	**Narrabeen Slopes Forest** Open-forest	*Eucalyptus deanei* *Angophora floribunda*	Narrabeen Group	Lower hillslopes, Broken Bay — Hawkesbury River
		Open-forest	*Angophora floribunda* *Allocasuarina torulosa*	"	"
🟦	9o	**Turpentine – Ironbark Forest** Open-forest	*Syncarpia glomulifera* *Eucalyptus paniculata*	Wianamatta Shale	Inner western Sydney, lower rainfall soils between Glenorie and Ryde; often near junction with sandstone
🟦	9sf	**Duffys Forest** Open-forest	*Eucalyptus sieberi* *Eucalyptus capitellata* *Eucalyptus gummifera* *Angophora costata*	Wianamatta Shale – Hawkesbury Sandstone	Residual plateau remnants with ironstone gravels
🟦	9t	**Coastal Dune Forest** Open-forest	*Eucalyptus botryoides* *Eucalyptus pilularis* *Angophora costata*	Holocene Sand	Ramsgate La Perouse
🟩	**Sydney Sandstone Complex** 10ag	**Sydney Sandstone Gully Forest** Open-forest/ woodland	*Eucalyptus piperita* *Angophora costata* *Eucalyptus gummifera*	Hawkesbury Sandstone	Sheltered hillsides, gullies
		Tall open-forest	*Eucalyptus pilularis* *Syncarpia glomulifera*	"	Gullies sheltered aspects
		Closed-forest	*Ceratopetalum apetalum* *Tristaniopsis laurina*	"	Sheltered gullies

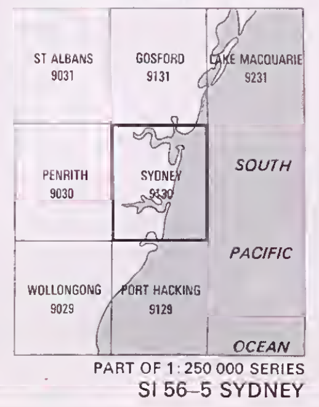
MAP UNIT DESCRIPTION

	MAP UNIT	STRUCTURE	MAIN CANOPY SPECIES	GEOLOGY	OCCURRENCE
⬜	**Sydney Sandstone Complex** 10ar	**Sydney Sandstone Ridgetop Woodland** Woodland/ low woodland	*Eucalyptus gummifera* *Eucalyptus haemastoma* *Eucalyptus sparsifolia* *Eucalyptus racemosa*	Hawkesbury Sandstone	Ridges, plateaus and dry, exposed hillsides
		Woodland/ low woodland	*Eucalyptus eximia* *Eucalyptus gummifera* *Angophora bakeri*	"	Ridges, plateaus, northwest of area
		Open-scrub	*Banksia ericifolia* *Hakea teretifolia*	"	Poorly-drained sites
🟧	21a	**Coastal Clay Heath** Open-heath	*Allocasuarina distyla*	Narrabeen Group	Long Reef to Bouddi
		Grassland	*Themeda australis*	"	"
🟥	21b	**Coastal Dune Heath** Open-heath	*Banksia aemula*	Pleistocene sand	Coastal dunes, Bouddi, North Head, La Perouse
		Open-scrub	*Monotoca elliptica* *Banksia integrifolia* *Leptospermum laevigatum*	"	"
🟫	21g	**Coastal Sandstone Heath** Shrubland	*Baeckea imbricata*	Hawkesbury Sandstone	Shoreline heath
		Open-heath/ closed-scrub	*Banksia ericifolia* *Darwinia fascicularis*	"	Coastal heath, sandy shallow, soils
		Open-heath/ closed-scrub	*Allocasuarina distyla* *Banksia ericifolia*	"	Widespread, shallow sandy, often poorly-drained soils
		Open-heath	*Baeckea diosmifolia* *Baeckea brevifolia*	"	Rocky outcrop heath
		Closed-heath	*Hakea teretifolia* *Banksia oblongifolia*	"	Wet heath, poorly-drained
		Sedgeland/ shrubland	*Banksia robur* *Viminaria juncea* *Gymnoschoenus sphaerocephalus*	"	Swamps, impeded drainage
		Open-scrub	*Angophora hispida*	"	Drier areas
		Shrubland (mallee)	*Eucalyptus luehmanniana*	"	Shallow soils, permanent seepage
🟧	27a	**Coastal Swamp Forest Complex** Open-forest	*Eucalyptus botryoides* *Eucalyptus robusta*	Holocene stream alluvium & estuarine sediment	Creekflats or impeded drainage, Warringah Peninsula
		Open-forest	*Livistona australis*	"	"
		Scrub	*Melaleuca linariifolia* *Melaleuca styphelioides*	"	"
		Reedland	*Phragmites australis* *Typha orientalis*	"	"
		Herbland	*Persicaria strigosa* *Blechnum camfieldii* *Triglochin procera* *Baumea juncea*	"	Impeded drainage
🟪	28c	**Coastal Freshwater Swamp** Open-sedgeland	*Eleocharis sphacelata* *Baumea juncea* *Persicaria decipiens*	Holocene marine sand & sandy peat	Botany Swamps, Centennial Park
		Low open-forest	*Melaleuca quinquenervia*	"	"
⬜	C	**Cleared**	These areas are mostly suburban development. Small remnants of vegetation too small to map may occur here.		

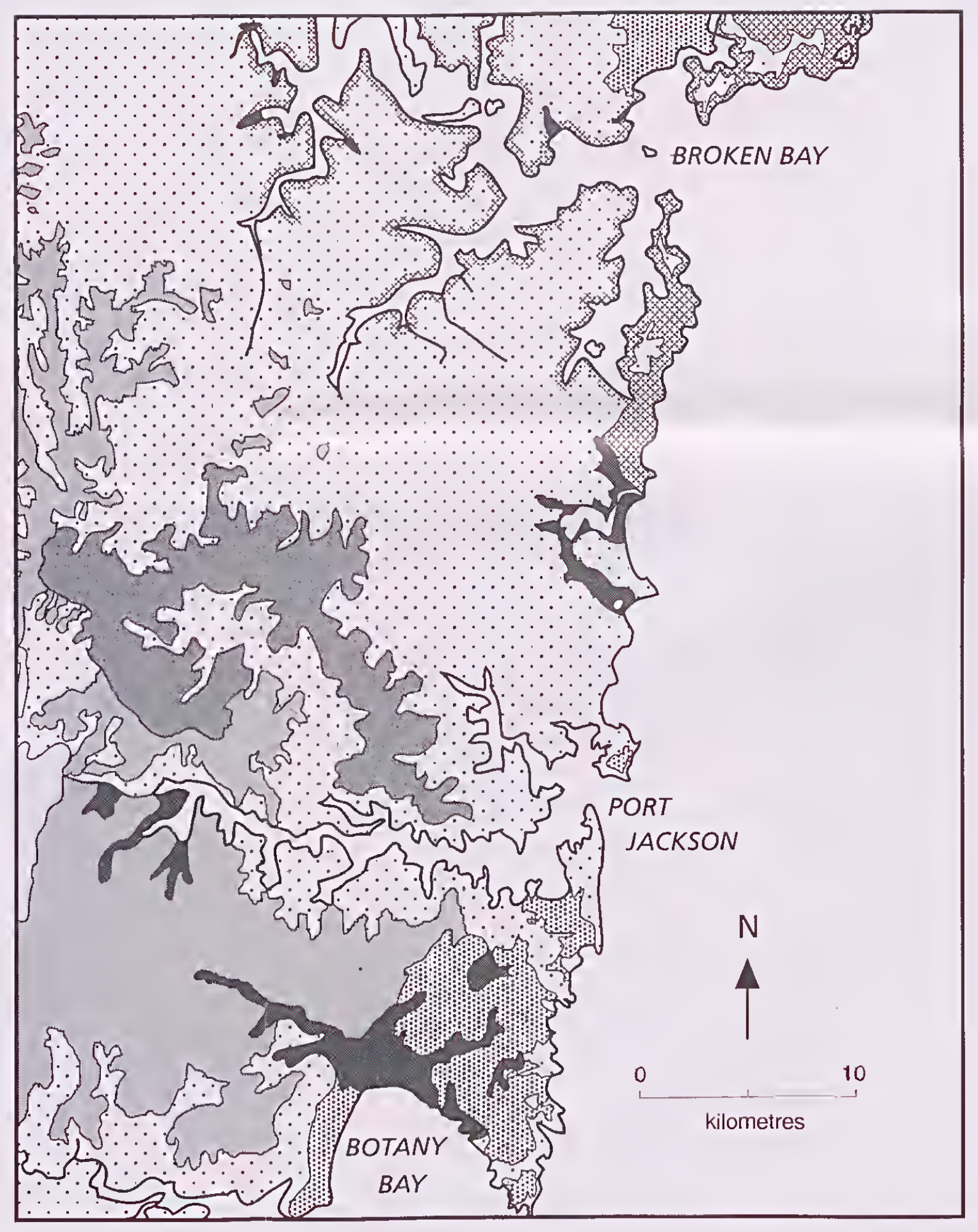


TRUE NORTH, GRID NORTH AND MAGNETIC NORTH ARE SHOWN DIAGRAMMATICALLY FOR THE CENTRE OF THE MAP. MAGNETIC NORTH IS CORRECT FOR 1976 AND MOVES EASTERLY BY 0.1° IN ABOUT THREE YEARS

INDEX TO ADJOINING MAPS



PART OF 1: 250 000 SERIES
SI 56–5 SYDNEY



Natural Vegetation 1788

▩	Blue Gum High Forest (map unit 6b)
▒	Turpentine–Ironbark Forest (map unit 9o)
□	Cumberland Plain Woodlands (map unit 9d)
▦	Eastern Suburbs *Banksia* Scrub (map units 9t, 21b)
■	Estuarine and Freshwater Wetlands (map units 4a, 27a, 28a)
⁘	Sandstone Heaths, Woodlands and Forests (map units 9sf, 10ag, 10ar, 21g)
▨	Narrabeen Group Forests (map units 9g, 9h, 21a)

NATURAL VEGETATION
# of the
SYDNEY AREA

Doug Benson & Jocelyn Howell

VEGETATION OF KU-RING-GAI CHASE NATIONAL PARK
AND MUOGAMARRA NATURE RESERVE
included as separate map on reverse

Detailed descriptions of the plant communities are given in
CUNNINGHAMIA Volume 3, Number 4, 1994
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ROYAL BOTANIC GARDENS SYDNEY
1994

Understanding the ecology of our native plants

CUNNINGHAMIA

A journal of plant ecology

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The natural vegetation of the Sydney 1: 100 000 map sheet 679
Doug Benson and Jocelyn Howell

Ecology of Sydney plant species
Part 2: Dicotyledon families Asteraceae to Buddlejaceae 789
Doug Benson and Lyn McDougall

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